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ON THE STUDY OF THE HAND
FOR INDICATIONS OF
LOCAL AND GENERAL DISEASE

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ON THE STUDY OF THE HAND.

ON THE STUDY OF THE HAND.

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MYXŒDEMA, CRETINISM AND
THE GOITRES.

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SEPTIC INTOXICATION.

SEWAGE POISONING.

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THE INFRAMAMMARY PAIN :
A Study in Evolution.

LONDON: HENRY J. GLAISHER,
57, WIGMORE STREET, CAVENDISH SQUARE, W.

ON
THE STUDY OF THE HAND
FOR
INDICATIONS OF LOCAL AND GENERAL DISEASE

BY

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Member of the Royal College of Surgeons ; Life Assoc. Sanitary Institute, Great Britain ;
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"Dandruff as a Cause of Facial Acne Pustulosa" ; "Chemistry of Animal Heat" ;
"Paludic Pathology" ; "Lepra Bacillus."
"Arterial Tension."

SECOND EDITION.



London :
HENRY J. GLAISHER,
57 WIGMORE STREET, CAVENDISH SQUARE, W.
NEW YORK : G. P. PUTNAM'S SONS.

—
1899.

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PREFACE TO THE SECOND EDITION.

The call for a Second Edition, within four months, leaves little time in a busy life for the remodelling of even a small work. Nevertheless, the book is practically re-written. Many valuable suggestions have been adopted, and much new matter has been incorporated into the text.

Cerebro-spinal Diagnosis from the Hand is now fully treated for the first time ; some new points in the Pathology of Arthritis and of Acrosphacelus are given ; the treatment of Writer's Cramp is fully detailed ; and the clinical significance of the various forms of Tremor is considered at length.

There is a special section on the Fallacies of the Radial Pulse ; the Dynamics of Respiration in relation to the Pulse ; the meaning of Fulness as distinguished from Tension ; fresh hints as to Chloroform Syncope ; and a new method of treating Varicose Veins and Hepatic Engorgement.

In classifying the Tremors, the arrangement used by Dr. Savill has been adopted, with some modifications ; whilst to Dr. de Watteville the writer's best thanks are due for revising this section.

Drs. Shuttleworth, Still and Warner have kindly supplied recent information as to hands of mentally-deficient children.

Drs. Langley and John Thomson have lent blocks, thereby greatly adding to the interest of the book.

Drs. Rayner and Harry Campbell have kindly corrected the Cerebro-spinal portion; and to Dr. Fortescue Fox the writer is grateful for the detection of overlooked errors in a late revise.

The writer, at considerable pains, has striven to make the Index as complete as possible, that it may form not only a ready method of referring to the text, but also that it may form a useful aid to the Practitioner in working up Special Diagnosis.

There are sixty-two additional pages; the work is enriched by twenty-seven new illustrations; and the bibliographies have been much extended.

LONDON, 1899.

PREFACE TO THE FIRST EDITION.

The best thanks of the writer are due to Drs. Telford-Smith and Harry Campbell for the loan of blocks, and to Drs. Radcliffe Crocker, Wyndham Cottle and Colcott Fox for so kindly correcting the cutaneous sections of this paper, thus bringing them up to the latest date.

Above all, he must record his obligation to Mr. Jonathan Hutchinson, for placing at his disposal the priceless archives collected in his Clinical Museum.

Indeed, these brief notes may be said to have drawn their chief inspiration from the teaching of that accomplished and many-sided Surgeon and Biologist.

LONDON, 1898.

Some Press Notices of the First Edition.

"The author of this interesting little volume has endeavoured to trace the connection of the changes which take place in the hands of patients suffering from general diseases.....Is well illustrated by several drawings."—*New York Medical Journal*.

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INTRODUCTION.

On those rare occasions when the aid of the European physician is sought for a female member of any Muhamedan family of distinction, the only part of the patient, which the doctor is permitted to see, is the hand, which is thrust for that purpose through a small opening in a curtain. Is it possible, we may ask, that a fairly respectable diagnosis might be based upon a sight of the hand alone?

Part of the purpose of this paper is to give a small instalment of the very large amount of general information that may be gleaned from a patient study of the hand itself.

Chinese physicians pay especial heed to the arrangement of the veins of the hand, especially in regard to prognosis.

The extent to which we may add to our knowledge concerning occupation, health, habit and character, by merely grasping the hand, would scarcely be suspected. Knox the Anatomist used to tell his Edinburgh students that the broad square hand with spatulate fingers, which belongs to the Anglo-Saxon race, accounts for their grasping tendencies! How charac-

teristic is the firm and friendly grip of a vigorous man, healthy alike in body and in mind ! Should the hand be both horny and strong, we say " here is a man in whom muscular exertion enters largely into his method of earning his living, or at least of employing his leisure." If the palm be callous and the grasp be feeble, we think of xeroderma from arsenical poisoning, or of some other type of hyperkeratosis. An atrophic and dead hand might belong to leprosy or scleroderma. A limp hand is naturally supposed to indicate a want of friendly cordiality ; it may mean much more than this. Wasted manual muscles might indicate phthisis, diabetes mellitus or paralysis. It might be merely senility, and it is interesting to note that the hands of women become thinner with advancing years than those of men. All this forms an interesting commentary on our proneness to misjudge and misunderstand our friends !

ON

THE STUDY OF THE HAND

§ I.

TEMPERATURE, DRYNESS, MOISTURE.

THE hand is often dry in cancer, in the cirrhotic forms of Bright's disease and in paralytic dementia. If the hand be hot and red or dry and claw-like, the possibility of diabetes enters the mind; if hot, dry and emaciated, the hectic of advanced tuberculosis is suggested. When one hand is persistently hot and the other is cold, the case may be one of subclavian aneurysm; but it is much more likely to be gout or else lead-poisoning. If the palm be not only hot but also clammy, the causes may be excitement, recent exertion, or hyperidrosis from rheumatoid arthritis and other causes. Excessive sweating of the hand is occasionally present in progressive muscular atrophy. A cold and dry hand may mean starvation, anæmia, feeble circulation, or one of the innumerable forms of vaso-motor ataxia. The hand is cold, harsh and swollen in myxœdema. If cold, clammy and tremulous, then hysteria, dyspepsia, melancholia, some depressing emotions of the mind, as terror and apprehension, and the action of such nerve poisons as alcohol, tea and tobacco, present themselves to us.

Certain conditions of the hand have been set down by ingenious writers as signs of secret vice. It would be cruel and invidious to record them; besides, the writer does not believe in them.

As regards the *appearance* of the hand, the first point that naturally attracts us is its colour, which it will be convenient to consider at the same time as its texture.

§ II.

COLOUR AND TEXTURE.

From the tint and texture of the hands, we may get many valuable hints as to occupation, habits, tendencies and mode of life.

Sometimes a profession is selected on account of the form of the fingers; while certain trades¹ leave an imprint, more or less pronounced, upon the hands. Thus artistic persons usually have slender and mobile fingers. Musical people have sensitive hands. We expect to see corns on the left finger-tips of violinists, and on all the fingers of harp players; bone-setters are said to have a peculiar thumb; goldbeaters have a thick right thumb, with large attached muscles; atrophy of the hypothenar muscles in cabinet-makers; copyists often show a corn on the little finger of the right hand, with a groove at the free end of the medius; the pulp of the left index is pricked and blackened in seamstresses; there are blue-black dottings on the hands of miners; blackened skin and nails in machinists; photographers have typical stains of pyrogallic acid; turners and coppersmiths have flattened finger-tips, the latter with green discoloration; bricklayers, too, have flattening of the digital pulp, but this is on the left hand, and is chiefly seen on the thumb and index; plasterers are marked on the left thumb and index with corns due to grasping the "hawk," which carries their cement. Coachmen also have corns on the right hand from using the whip, and on the sides of the left fingers from friction of the reins.

By careful study of the hand, a fair hit can often be made as to inveterate habits. Thus if, with marked tremor of the hands, we notice that the forefinger and the thumb, especially of the left hand, be stained yellow, we may think of immoderate cigarette-smoking; ulcers at the base of the nails, with ecchymotic spots on the adjacent skin, might suggest the chloral habit. Those who habitually handle irritating drugs, like elaterium, also get sores at the nail insertion; whilst such widely differing causes as the use of arsenic as a cosmetic, and certain forms of athleticism, such as tennis, will lead to thickening of the skin of the palm.

A white hand may mean good birth and idle habits; whilst an exceptionally white hand may show that, amongst other things, either the arteries are small in calibre or flaccid as to coat. Such a state of things may mean, too, that pigment is deposited in small quantities, or else that the arterial blood-supply is poor in quality or deficient in quantity. This would bring before our minds the possibilities of anæmia, of carcinoma, of toxism by tea, tobacco, or sewer gas, or else by some inorganic poison as lead, arsenic or mercury. A smooth, thin, satin-like texture of the cutis, indicating atrophy—a condition usually associated with *Asteatosis*, or lack of oil in the skin—betokens a result of neuritis, of nerve injury, or else of vaso-motor disturbance, unless the patient be in advanced life, when a dry skin is normal.

The condition described by Langdon Down as the woolly hand of a certain type of imbecility, in which the skin is loose, harsh and thickened, is allied to or identical with the state of things in cretinism or infantile myxœdema.

Dr. Shuttleworth tells the writer that of the several types of imbecility, such as the cretinoid, the Mongol, the nervous and the paralytic, each has its own peculiar and distinctive kind of hand. He adds this interesting note:—
“In everyday work of diagnosing feeble-minded children

for special instruction under the London School Board, I find that not only the form of the fingers, but that of the hand generally, the habitual attitude and the manual myotonus or its absence, are of great service in determining the mental state." [Comp. WARNER, "Brain," Vol. VI.]

A swollen hand, pitting on pressure, if bilateral and wax-like, would speak of advanced renal disease; on the other hand, if the œdema be unilateral, it would indicate axillary aneurysm, adenoma or traumatism. Swelling of the hands, with bloated face, might suggest alcoholism. Swelling that does not pit on pressure, would suggest myxœdema or an angioneurosis. If the œdema be angioneurotic, it might be either pale or red. The chief clinical point about it is that it is not a fixed quantity. It comes and goes in a most irregular way. A purplish tint, seen in warm, as well as in cold weather, would hint at defective blood-aëration, starvation, scurvy, or such a vaso-motor ataxia as we see accompanying various disorders which involve local asphyxia, as in Raynaud's disease. When combined with clubbing of the finger-ends, congenital mitral affection would be suggested, or we might think of Marie's disease [pulmonary hypertrophic osteo-arthritis]. On the other hand, it should be borne in mind that it is natural to some persons to have blue extremities. It causes no inconvenience, and it cannot then be viewed as a morbid condition.

Purple spots are found on the skin of the hands in a great variety of disorders. When the physician is summoned to a case of complete loss of consciousness, their presence may form a valuable element of diagnosis in a condition which is always embarrassing enough. Should he hesitate between the coma of diabetes and that of uræmia, then the existence of yellow spots on the back of the hand and forearm would be in favour of diabetes, whilst purple maculæ² would point to uræmia. Petechiæ on the dorsum of the hand might be due to the bite of a flea, to senility,

scurvy, rickets, gonorrhœa, syphilis, small-pox, scarlatina, septicæmia, malignant endocarditis, pyæmia, jaundice, cancer, typhus, measles, albuminuria and Hodgkin's disease.

Many toxic agents have the power of producing petechiæ—for example, tincture of benzoin. (Tilbury Fox, "Lancet," Feb. 7, 1874.) Amongst the commonest are quinine, copaiba, mercury, belladonna, arnica, phosphorus and ergot, but above all the iodides. Some of the petechial eruptions attributed to syphilis are undoubtedly due to iodide of potassium. Fournier, as early as 1877, described cases of purpura caused by iodide of potassium. To Jonathan Hutchinson is due the credit of drawing the attention of the profession to the perils of pushing iodides in certain persons. (See the "Pedigree of Disease," p. 54.)

Tom Robinson gave three grains of iodide of potassium every day to a man aged 63: in six days a diffuse purpura appeared. ("Lancet," March 4, 1893.)

Stephen Mackenzie reports, in the same paper, the death of an infant of five months, with purpura, after a single dose of $2\frac{1}{2}$ grains of iodide of potassium.

A man took 45 grains of iodide of potassium for ten days. He showed on his hands, etc., erythema, urticarious weals and bullæ [dermatitis herpetiformis]. (Mons. Danlos, Soc. Médicale des Hôpitaux, January, 1899.)

Purpura followed by gangrene, has been recorded by Shephard³ as occurring after the administration of sodium salicylate; such a condition might be mistaken for peliosis rheumatica [Schoenlein's disease].

Purpura accompanies many of the neuroses. It is seen with chorea and rheumatism, but more especially with the myelopathies, such as locomotor ataxia and its allies. The sites of lightning pains are particularly prone to be visited by purpura. According to Mr. Jonathan Hutchinson, the thrombotic form of purpura is often seen with varicosis.

All this means that the various forms of neuritis, most

of them probably toxic (*r.* paper on Purpura⁴ of Childhood, read recently at Marseilles Congress by Dr. Léon Perrin; reported in "Lancet," p. 1567, Dec. 10, 1898), are prone to be followed by vaso-motor paresis, with consequent exudation of blood, which may be altered in constitution, as well as modified by the presence of morbid material.

If ecchymoses occur in a child, then we may think of the relapsing purpura of Henoch, formerly known as "febrile purpuric œdema," more especially if there be present the following group of characteristic signs:—Abdominal pain, with tenderness on pressure; green vomiting and blood-stained stools; swollen and tender joints; and with these symptoms a marked tendency to recurrence at stated intervals of about eight days. Other juvenile forms are epidemic hæmoglobinuria, or Winckel's disease, in which the spleen is occasionally found enlarged. Some cases are complicated with acute fatty degeneration of the internal organs—the condition known as the disease of Buhl.

Many years ago, Graves of Dublin pointed out that purpura is very prone to be associated with the diarrhœa of children, now looked upon as nearly always bacillary. We may note here that purpura does not arise from rheumatism, but that the poisons which cause arthritis, induce also vaso-motor paresis, with certain blood changes; and that these together lead to extravasation of blood in the tissues. This is true too of non-vital or inorganic poisons, such as mercury, iodine, arsenic and phosphorus.

If purpura occur in a girl, it is then probably either angioneurotic œdema, or the *morbus maculosus* of Werlhof, known in this country as *purpura hæmorrhagica*. This disease sometimes proves fatal within twenty-four hours; it is then recognised as *purpura fulminans*. A very complete account of the different forms of purpura and allied eruptions may be found in Osler's "Medicine."

Ecchymoses easily form on the hands of the subjects of

hæmophilia, a disease which differs from the other allied conditions by being nearly always hereditary.

When the petechiæ are associated with nettle-rash [*purpura urticans*], and with these, there are found to exist multiple arthritis, scanty and albuminous urine and raised temperatures, we may have to do with Schœnlein's disease [*peliosis rheumatica*]. Here sex and age will help us, for this disorder is practically confined to males between twenty and thirty years old. All the adult forms of the purpuric group are apt to be associated with arthritis.

Purpura urticans, with œdema and severe vomiting, have, according to Morse, followed the injection of diphtheria antitoxin.

If the nail be transparent, then a most convenient window into the circulation is afforded by it. It is valuable for viewing the state of the peripheral circulation. Various changes in the blood and in the tubes which convey it, such as arteritis, anæmia and supervenosity, may be estimated here. Again, capillary pulsation may be studied at this point.

Yellowish red papules or nodules, occasionally seen on the back of the hand, but more commonly on the elbow, may be *xanthoma⁵ diabeticorum*; in any case the matter should be set at rest by an examination of the urine for sugar.

Larger and darker spots, round or oval in shape, known as "xanthoma" or "xanthelasma" rheumatica, but incorrectly, because they do not rise above the surface, are especially found on the hands, face and neck. They are really a form of lentigo. When seen on the upper extremity, they correspond with the cutaneous distribution of the musculo-spiral nerve. The connection of these perverted pigment-changes with rheumatoid arthritis, was recorded by the writer seventeen years ago,⁶ four years before they were so fully re-described by Dr. Kent Spender of Bath.

It were well to reserve the term "xanthelasma" for the raised yellow patches, seen especially in young subjects, who are often prone to sick-headache. The favourite site being the left eyelid, beginning on the depressed area of skin above the inner canthus. Mr. Hutchinson has noted how frequently these patches are followed by comedones.

Brown spots, which do not disappear on pressure, are seen on the dorsum of the hand in the later stages of many of the diathetic diseases, notably in adult scurvy, in syphilis, in osteo-arthritis, in tubercular phthisis, in carcinoma and in *xeroderma pigmentosa* or Kaposi's disease, one common factor being the presence of the pyogenic process. Arsenical poisoning, Graves' disease, and morbus Addisonii, often have this symptom in common. When in Norway, the writer observed brown pigment spots on the face and on the extremities of leprous subjects. However white the hands may have been, they usually grow red in the earlier stages of rheumatic gout. At a later period the tendency is to grow brown. As the skin atrophies, the tone generally deepens, a brilliant blonde growing in time to be as dusky as an Asiatic. This fact of the steady tendency towards involvement of the whole of the expansions of the sensory nerves, taken in conjunction with the tachycardia, the dysidrosis and the other well-known angioneurotic signs, serves to show how prominent is the part played by the nervous system in rheumatoid arthritis.

§ III.

THE NAILS—THEIR DEVELOPMENT.

MODE OF NAIL GROWTH.—We will now consider very briefly the normal method of nail production. The changes in the upper surface of the nail must originate in the

bottom of the nail-fold, for these are continuous. It is obvious too that the narrower the nail-fold, the more rapid is the growth of the nail and the less is its thickness.

The blood supply of the papillary layer of the substratum of the nail is divided into several areas, each covered with rows of papillæ. The vascular supply is very peculiar, resembling in some respects an erectile tissue, such for example as that of the corpora cavernosa. The actual substratum consists of loose connective tissue, containing convoluted glands and some fat.

RATE OF NAIL GROWTH.—A considerable divergence of opinion exists as to the rate at which the finger-nails grow. Beau gives as a rule that the nails of the hand grow one millimeter per week. At this rate the nails, which average fifteen millimeters in length, would take 105 days to grow out. Dufour gives 121 to 138 days.

The fact is, the pace of growth varies very much, not only at different ages but in different individuals of the same age. Influenced by many external and internal conditions, the pace also varies in the same person from time to time. I have known a difference of seventy days between subjects of the same age and sex.

A few fresh observations will be submitted to the notice of the reader as to the rate of growth of the finger-nails in men at different ages:—

At 21 years, the nail was replaced in 126 days.

„ 31	„	„	„	159	„
„ 32	„	„	„	88	„
„ 55	„	„	„	110	„
„ 67	„	„	„	144	„

It is curious that in this group the swiftest grower was a tubercular subject, who had a sharp attack of blood-spitting during the observation. Possibly we have here, as

in hyperkeratosis, a suspension of inhibitory nerve influence. Compare with tubercular tachycardia. We know to what an extent the nutrition of the finger-tip, including the nail, is influenced by tubercular phthisis. There is little doubt that this influence is exerted by the products of suppuration, because in destructive pulmonary phthisis there is always a mixed infection.

Jalrowski has shown that the hectic of consumption is a true septicæmia. In nine patients, not less than seven had pyogenic cocci in the blood of the finger. (*Centr. für Bakt.*, Dec. 9, 1893.) But pus will not only produce occasional fever, it will also cause persistent increase of heart-action, probably by its sedative influence on the floor of the fourth ventricle, leading to a suspension of cardiac inhibition.

Sea air is said to quicken the growth of the nails; profound grief has been credited with the power of destroying them.

A valuable point in diagnosis is afforded by the growth of the finger-nail. In distinguishing between true paralysis of centric origin, and the various pseudo-paralyses of hysteria, which sometimes so closely simulate organic disease, it is well to remember that the growth of the nail is modified by most of the centric lesions, whilst its development is not affected by hysteria. It is asserted that intracranial hæmorrhages arrest the nail growth.

Stephen Mackenzie has suggested a method for roughly estimating the proportion of red corpuscles in the blood. It is to watch the extent to which the nail is bleached by pressing the finger pulp. I have made a number of observations, but I can find no absolute rule.

COLOUR.—Duskiness of the nails, if acquired, suggests defective action of heart or lungs, innutrition, cold weather or general feebleness.

Paludal fever causes a typical change of tint in the nails. A peculiar slate-grey discoloration of the finger-nails

appearing before the rigor, increasing during the cold stage, and attaining its maximum in the middle of the hot period, after which it slowly disappears, is said by Boisson, a French military surgeon, to be pathognomonic of an ague fit.

This is quite possible, because it is now known that the hot and cold stages of ague—the heat and cold, by the way, are subjective—correspond with the fission of the malarial protozoon. At this point a large proportion of the hæmatin has been destroyed by the protozoon, and converted into a melanic material, which is set free by the disintegration of the protozoon. The presence of this melanin in the blood, together with the diminution in the quantity of the hæmatin, would explain the grey look of the nails.

The nails are pale in hectic and in anasarca, grey in serious internal disease, yellow in jaundice, white in convalescence, chalky in some forms of paralysis, livid in ague and in Raynaud's disease, chronically purple in cyanosis.

A bluish-grey hand might be due to cyanosis or to silver staining. It might be needful to distinguish them, though argyria is not now so common as it used to be. The internal use of lunar caustic having been replaced by the bromides in the treatment of epilepsy. They are differentiated by the fact that argyria or nitrate of silver staining does not, like the tint of cyanosis, disappear on pressure.

White spots on the nails are without doubt often due to local injury; but this is by no means the only cause. On two occasions Langdon Down⁷ saw transverse white markings of the finger-nail, occurring with ulcer of the cornea, in a professional man of studious habits. According to Geber, white spots indicate hypokeratosis.

That careful observer, Murchison, noted that during the febrile state, in relapsing or famine fever, the nutrition of the nails is impaired—white marks (see white anæmic stripe, Fig. 3, page 15) are developed upon them co-incidentally with the attacks of pyrexia, but *not* with the apyretic interval.

Doubtless there are other pathological relations of white nail which will presently be observed and recorded.

The lunula owes its white colour to the fact that the matrix here contains a number of opaque elements which scatter light. These are the "transition," or so-called "keratogenous" cells. They stand midway between the prickle-cells and the nail-cells proper.

BRITTLENESS.—Many skin diseases, more especially eczema and psoriasis, are associated with brittle nails. It has been asserted that brittle nails accompany diabetes mellitus; as a matter of fact, the subjects of glycosuria are prone to neuritis, and any form of peripheral neuritis, from gout to beri-beri, may be followed by fragility of the nails. It is for this reason that the nail of advanced gout is so often striated or laminated. This is not because the nail is gouty, but because gouty persons are so prone to multiple neuritis. Certain "plateau-markings" have been described by Dr. Cooper as occurring during the course of some malignant diseases and also after profound mental emotions.

RIBBING, SPLITTING, AND FLUSHING.—Milner Fothergill⁸ aptly compares a nail to a row of agglutinated hairs.

A glance at the dentated processes under the nail, alternating with the ridges of the nail-bed (as shown in Fig. 5), will explain why the nails when atrophied, as after neuritis, must grow more and more ribbed, as they diminish in thickness.

The finger-nails are normally marked with longitudinal striæ in the anthropoids. This ribbing has been lost in man. When present it is a sign of disease. Like so many disorders associated with innutrition, it is a reversion to an earlier type. In many infective disorders, as Graves' disease and rheumatoid arthritis, the nails are found to be ribbed and sometimes laminated.

If ribbing and splitting of the nail be viewed as a result

of toxic neuritis, it is easy to understand its association with bromidrosis, or offensive sweat, an ordinary concomitant of septic neuritis.

With regard to psoriasis, according to Hutchinson, if the disease be typical and the nail be affected, the disease is one of the nail-bed. The nail becomes separated from its bed. No such separation is seen in eczema, in which the nail tends to be covered with small pits like pin-pricks. The gouty flush-erythema may be viewed as "potential" eczema. The surface is *raised* as well as *red*.

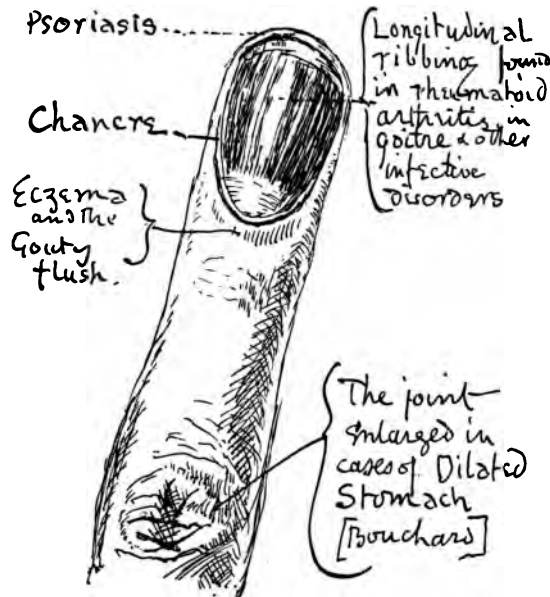


FIG. 1.

The children who can boast of a gouty ancestry appear to be especially prone to such vaso-motor disturbances as hæmophilia, and they are also addicted to nail-biting. These two tendencies are not so wholly unconnected as they might seem at first blush to be. It is admitted that the

children of gouty parentage are neurotic in their tendencies; but I have observed that their fingers are not irritable because they are bitten, but they are picked or bitten because they are irritable.

A paint consisting of ten grains of ichthyol and one ounce of filmogen, applied to the nail-border after washing the hands, will often cure the habit by removing the irritation.

The gouty flush beneath the nail, and seen through it, especially along the distal margin of the lunule, is not entirely due to increased redness, for in part it owes its existence to the progressive thinning of the nail, which takes place in established gout. Careful examination will show that the skin which bounds the lunule, is not only reddened, but is also swollen.

A rosy palm, viewed by manicurists and their clients as a beauty, is really a morbid condition. It accompanies many forms of neuritis, and is related to acroparæsthesia—an affection known in the States by the not very musical term "erythromelalgia."⁹

Visible venation should be observed when it occurs in the palm. Sometimes seen as a congenital peculiarity, when acquired, it may mean obstruction to the passage of venous blood through the right heart.

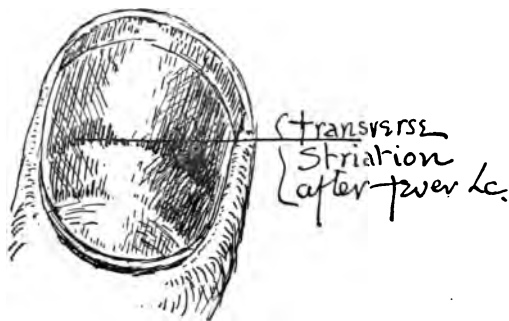


FIG. 2.

Transverse furrowing of the nail is a sign of temporary

ERRATUM.

Page 14, line 6, for "Filmogen" read "Flexile Collodion."

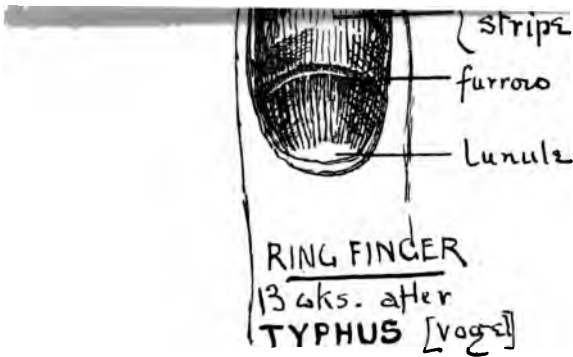


FIG. 3.

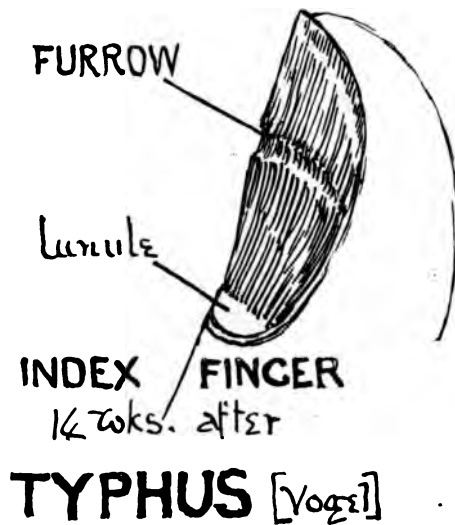


FIG. 4.

THE STUDY OF THE HAND.

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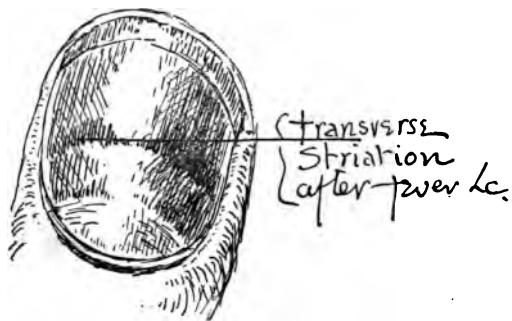


FIG. 2.

Transverse furrowing of the nail is a sign of temporary arrest of ungual development. It occurs in the acute fevers, especially in those accompanied by exfoliative dermatitis, such as scarlatina.

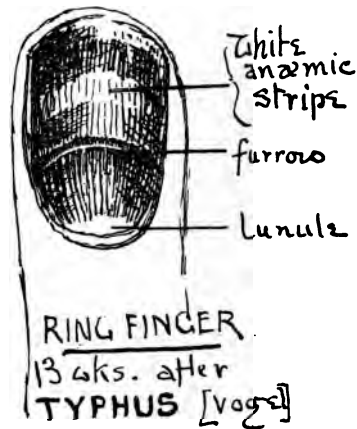


FIG. 3.

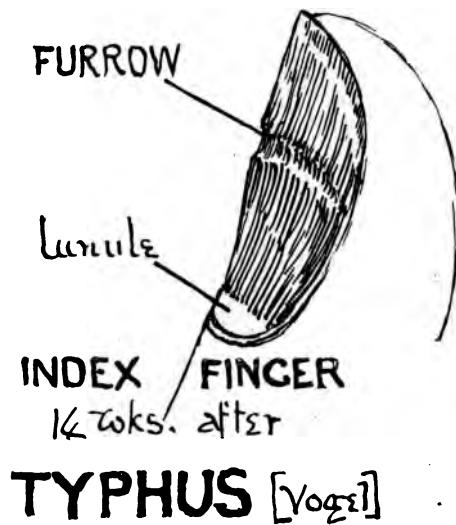


FIG. 4.

Some good observations as to the influence of typhus fever on the finger-nails, have been made by A. Vogel (see Bibliography.) The two illustrations on p. 15 are drawn from his work.

Murchison has recorded at p. 517 of his work "On Continued Fevers," that the nails may present, in enteric fever, markings similar to those which follow an attack of typhus and other acute diseases.

But an infinite variety of other causes will lead to transverse furrowing. Among them are surgical poisoning, peritonitis, sea-sickness, the opium habit, acute eye-disease and influenza.

Increase of the lateral nail-curve is said to be a sign of

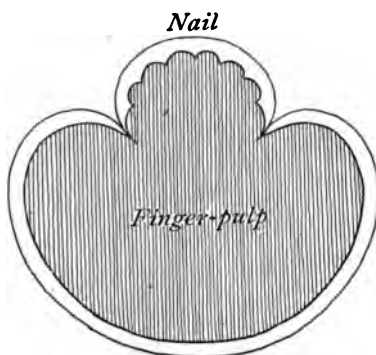


FIG. 5.

syphilis; it is probably a result of atrophy of the finger pulp, the sides of the nail, losing their lateral support, naturally fall in. It has been observed to occur, with brown discoloration, after hemiplegia [Hughlings Jackson]. Exaggeration of the longitudinal curve is quite a distinct condition from clubbing of the extremities of the fingers; it will, however, be conveniently described with that peculiarity.

§ IV.

PARASITES—ANIMAL AND VEGETABLE.

The presence of parasites may greatly modify the form of the nail. This can be understood when we remember that the eggs and the excrement of sarcoptes have been found by Boeck embedded in the actual nail substance. Under the influence of the scabietic occupation, the nail-bed may itself become hypertrophied, whilst considerable bulging may take place along the centre of the nail longitudinally. The lower surface may be studded with irregular projections, alternating with hollows, either deeply excavated or conically depressed. The nails may become horny or claw-like, much thickened and having a yellowish white or

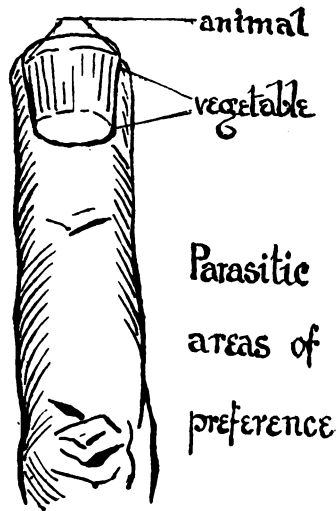


FIG 6.

brownish hue. On section they show an arrangement resembling asbestos, with whitish or yellow fibres. Bergh also found itch-mites, eggs, egg-shells, burrows, skin and excrement of parasites, in the substance of the finger-nails.

In warmer climates the sand flea—*pulex penetrans*—may cause violent pain and paronychia.

A nail which is pitted, frayed, and intersected by furrows, discoloured, greyish or yellowish, opaque, and more or less lifted from its bed, would suggest the possible presence of vegetable parasites. These tend to attack the side of the nail, whilst animal parasites prefer the free border, the peculiar province also of psoriasis.

The chief forms of onychomycoses are *favus* and *tinea trichophytica*.

The age factor is of importance in distinguishing between the various vegetable parasites. Ringworm of the scalp is practically unknown after the twenty-fifth year. From that age, until about fifty, pityriasis versicolor has its reign, then the body steadily establishes an immunity with regard to both of these invasions.

The effects of vegetable parasitical invasion are, that after a considerable time the matrix becomes involved, then growth-changes take place, the nail becoming claw-like and solid in some cases. In others the nail may come off in flakes, leaving a surface of faded dirty yellow colour, a most disfiguring condition.

The finger-nails are great sinners in the way of disease-convection. They may carry the staphylococcus from the hairy scalp, affected with seborrhœa, to punctate acne of the face, thereby changing it to acne pustulosa. (See an article by the writer in the "Lancet" of December 27, 1890.) The tubercle bacillus can be thus conveyed from an itching nostril to a cutaneous gland or to the edge of the eyelid, setting up lupus vulgaris. At the Bordeaux Skin Clinic, a careful search of the inside of the nasal fossæ was made in all cases of facial lupus vulgaris. In most instances unsuspected intra-nasal lupus was found to exist. (Dubreuilh et Frèche, Arch. Clin. de Bord. Jan., 1896.)

With regard, again, to the preventable perils of the puer-

perium, to quote the terse and vigorous words of John Chiene of Edinburgh, a dirty finger-nail may carry "death and damnation in the way of childbed-fever to the lying-in room."

Thickening of the nail, usually found near the free extremity, is in this country usually caused by psoriasis. More rarely it results from eczema, lichen ruber, leprosy and filarious invasion. Certain neuropathic affections, as neuritis, chronic myelitis and traumatism of a nerve-trunk, have been followed by this condition, which rejoices in the unattractive name of "onychauxis"!

The finger-nails are *damaged* by syphilis, usually the acquired form; *destroyed* by congenital pemphigus; the latter leaving, however, the pulp. Whilst in leprosy, not only the nail, but more or less of the finger itself disappears bodily, perishing through neurotrophic changes. One or more fingertips may be lost through frost-bite, ainhum, the disorder known by the name of Morvan, *i.e.*, analgesic paresis of upper extremities, now thought to be a form of syringomyelia, by some said to be overlooked leprosy. Other causes of digital shortening are Raynaud's disease and the various kinds of gangrene, including ergotism, accident, the surgeon's knife and congenital amputation.

The pathology of Acrophacelus has never been properly worked out. The physical conditions which exist in the various forms of arthritis, whether they be rheumatic, gouty, syphilitic or scorbutic, are found in the subjects of gangrene. Common to all is a tendency to diminution of the arterial calibre. Blood, often deteriorated in quality, always lessened in quantity, not only fails to supply sufficient nourishment to the tissues at large, but to the special structure of the arterial wall itself. The vasa vasorum, originally small in sectional area, are now much shrunken. The nervi vasorum, undergoing pressure, become atrophied. Fibroid degeneration proceeds, sometimes aided by hyperleucocytosis, till the whole artery degenerates into a mere fibrous cord, quite

unable to convey any blood at all. The tissues lingering long on the verge of blood-bankruptcy, by exposure to cold, or to trauma, or with the aid of an embolus, may be hurried over the brink into total ruin.

It is easy to see that the tendency to shrunken arteries, found in Bright's disease, in atheroma, in osteo-arthritis, in pregnancy, in lead-poisoning, in myxœdema, and in acquired syphilis, is greatly increased by exposure to cold. We can readily understand the great relief afforded by such hot-air baths as those of Greville, of Dowsing, and of Tallermann.

As usual, a careful consideration of the special anatomy of a joint, supplies the key to its pathological secrets. Articulations proper, have in their interior, no direct arterial supply. Hence they are particularly prone to suffer from want of nutritive material. This explains the well recognised fact that the joints most used are the first to go, as in certain trade rheumatisms.

An articulation like the knee, having a very extended surface, largely used and sustaining often a considerable weight, thus doubly exposed to traumatism, is a good example. The knee will often crepitate in the subject of osteo-arthritis, long before any other joint shows signs of degeneracy. The actual anatomical changes in the infinitely varied forms of arthritis are substantially the same. First fibrous degeneration of the cartilage, then ossification, and afterwards, in the fortunate cases, eburnation. In the unlucky cases, slow erosion of cartilage without renewal and with ultimate ankylosis or else dislocation. Suppuration being the exception rather than the rule.

The treatment of acrosphacelus, or digital gangrene, is of course bound up in its pathology. If the cause be the chilblain diathesis—Raynaud's disease,—then the indications are twofold, namely, local warmth and liberal diet. Ergotism, leprosy and mycetoma would each require separate consideration. Should the cause be gout, then the arteries

being contracted and inelastic, various manœuvres may be practised to overcome these two conditions. Warm water immersions, the electro-thermic warm air-bath and *superficial* massage.

It will be remembered that Dr. George Oliver finds by direct measurement, that hot baths and deep massage both *contract* the arteries. ("Pulse-gauging"; Lewis, 1895, pp. 18, 66.)

Allied to Raynaud's disease are sclerodermia and acroparæsthesia, the latter condition being sometimes known by the somewhat cumbersome and ungraceful term, "erythromelalgia." The chief symptoms are swelling and redness of the finger-tips, with either pain, tenderness—which may amount to exquisite sensitiveness—or else numbness or formication. It occurs in the course of various hysterical and neurasthenic conditions; it is not rare as a sequel to the neuritis of influenza, and it is sometimes seen in tabes.

That gifted writer, Dr. Weir Mitchell, who first described this disease in 1872, has recently published in the "American Journal of the Medical Sciences," Jan., 1899, a most careful and complete account of a case in which an opportunity was afforded of histological examination of the tissues involved. Briefly it is as follows:—

NERVE SUBSTANCE.—The nervous tissue had not only undergone fibroid degeneration, but had nearly entirely disappeared.

ARTERIES.—The vascular changes were very marked, the media thickened, the intima proliferated to such an extent that the lumen was nearly filled by projecting processes from the intima.

BONES.—These were found to be much enlarged.

Dr. Weir Mitchell, when he first encountered this condition, deemed it to be a centric disease—in fact, an affection of the spinal cord. He now looks upon it as peripheral, styling it "a nerve-end neuritis,"

Psoriasis of the palm, unless produced by arsenic or by traumatism, is often associated with specific infection.

It may be roughly said that the dorsal aspect of the hand is the domain of gout, and that the palmar side is the area of secondary syphilis.

The primary manifestation of syphilis on the hand, has no elective site, its position being settled by the accident of local trauma. The chancre is indeed occasionally found on the finger because, with the possible exceptions of the lip and the tongue, that is, next to the external genitalia, the point most exposed to infection. On the finger, a crack in the nail-fold or a hang-nail, often decide the site of invasion.

We may bear in mind that chancre of the finger presents an entirely different appearance from that with which we are familiar in its more ordinary situation. It begins as a bright red spot, grows quite rapidly, and in a fortnight after its first manifestation it may exceed one centimeter in diameter. It is quite easy to overlook its specific nature.

It may be dull or rosy, depending for its tint on the tendency to venous stasis of the person infected. The surface may be very angry-looking during the active stadium; and when the acute stage has subsided, there often remains a typical brown spot which, to the initiated, tells its own story.

Congenital Syphilis as displayed in the finger is very typical. (Taylor.) A single joint presents a very swollen condition, fusiform in shape; on this is displayed a characteristic ulcer, callous under ordinary treatment, soon yielding to good food, warmth and mild mercurials.

A ruddy injected line, raised slightly above the surface and bordering the lunular fold (see Fig. 1, p. 13), is very suggestive of gout. It is interesting that a similar fold of epithelium, at the labial aspect of the insertion of the teeth, known as "the gingival organ," is also an area of election for certain gouty manifestations—for example, pyorrhœa alveolaris or Rigg's disease.

§ VI

PANARIS OR PARONYCHIA.

The site of whitlow is the site of primary specific infection of the hand.

The washerwoman's disease has been attributed to poisoning by soda, but the exceedingly valuable provings on his own person, made by Garré, detailed in the "*Fortschritte der Medicin*," Vol. III., No. 6, 1885, have put it beyond cavil that this form of panaritium is an invasion of staphylococcus, supplied by the soiled linen of the laundry. Garré established a most important point, viz., that the *S. pyogenes aureus* requires no breach of surface to enter the system. Only a little rubbing, such as is supplied by the collar at the back of the neck, is needed, and an inflamed follicle, or even carbuncle, may be produced. The particular kind of micro-organism needed being supplied from that convenient culture-bed—the hairy scalp. This accounts easily for the elective points of localised abscess. The suppurative processes, localised on the nape of the neck, are especially prone to be followed by cheloid, which, however, nearly always disappears spontaneously in time.

The possibility of either tubercular or syphilitic origin in the case of obstinate whitlow, would of course be borne in mind, nor should we forget that panaris is a symptom which occasionally complicates syringo-myelia. The presence of analgesia, and the loss of the thermic sense, the well-known signs of Charcot, will help to identify this not very common disease.

It is of the greatest possible importance to distinguish between the various forms of whitlow. Some belong to the family of the tuberculides; these are etiologically connected with the verruca necrogenica, seen on the hands of dissecting-room porters, house-surgeons, cooks and butchers. These

must not be confounded with the acute or chronic syphilitic ulcer; nor with the whitlow of septic infection, so often seen in underfed children in a house with defective drainage.

PAPILLOMATA—WARTS.—Warts may be either simple or pigmented—the latter appear to be prone to take on malignant action under certain forms of irritation. All kinds of warts are apparently auto-infective. From this fact, and from the success of local salicylic treatment, it seems probable that, if not actually induced by bacillary action, they form an appropriate nidus for bacteria, which serve to perpetuate, if they do not produce the papillary hypertrophy.

Each of the great diathetic diseases may be represented by this lowly form of symbiosis, which presents so many points of resemblance to the ordinary tree-lichen.

Lupus Vulgaris, when found on the fingers, is often warty. The “necrosing nodule” of the French dermatologists is supposed by some to be of tubercular origin. Lupus erythematosus, which rejoices in a most unfortunately misleading name, has, of course, no connection with any bacillus. Its association with lupus vulgaris is, *pace* Mr. Jonathan Hutchinson, purely one of nomenclature. It is probably a local angioneurosis. It may be looked upon as an exaggerated and stereotyped blush. It is more nearly allied to Raynaud’s disease than to any tuberculide. That it may form an appropriate nidus for the tubercle bacillus, is possible, and this may have lead to its misleading nomenclature. Lupus Vulgaris may occur in any kind of constitution. It will come in those of clear skin and with a high colour. Lupus Erythematosus is usually seen in under-nourished subjects with low tension arteries, sluggish circulation, cold extremities and mental torpor. Lupus vulgaris is best removed by the electric cautery, or by Paquelin’s thermo-cautère; taking care not to burn too much at one sitting. Lupus erythematosus is best treated as a neurosis of innutrition. Tonics, cod-oil, plenty of carbohydrates in the food

ing traumatism. A good example of this is Dupuytren's finger.

Dupuytren's contraction, always found on the palmar aspect, sparing the thumb, is often hereditary. A tight band passes from the root of one finger towards the wrist, usually in the ulnar distribution. It is tempting to view this band as being formed by one of the flexor tendons; as a matter of fact, it is never tendinous,—the fascia is the real seat of this curious disorder.

It is an adult male disease, seldom seen in women, probably because the hand is less exposed to injury. It is rare in the young, whilst the frequency with which it occurs in coachmen and huntsmen, suggests trauma as an exciting cause. Hutchinson has insisted that it is not to be confounded with congenital contraction of the little finger, common to both sexes.

The distinctive features may be tabulated thus:—

<i>Congenital</i> form is often—	<i>Acquired</i> form is usually—
(1) Hereditary; it is	(1) Unilateral. If bilate-
(2) Stationary, and nearly	ral then
always	(2) Asymmetrical, and it
(3) Symmetrical.	is essentially
	(3) Progressive.

Many of the sufferers from gout, and most of the subjects of rheumatoid arthritis, are prone to temporary attacks of chondritis with fibrous degeneration, followed by bulging of the cartilage, known as "lipping," due to muscular traction, on the opposing articular surfaces.

I will not go into the question of what is the distinction between Heberden's nodes and Haygarth's nodosities, about which so many doughty pathological knights have broken a lance! It is now the fashion to say that the former are gouty—the latter rheumatoid. As against this view, tophi are usually found in the middle line, whilst rheumatoid nodules

on the palm of the hand, is not unknown after influenza; also as a sequel of severe dysidrosis, and occasionally as a result of liberal drugging. More especially is this the case with the iodides and the bromides; though the real elective areas of both the bromodermata and the iododermata, are the tracts of skin supplied by the fifth cranials and the musculo-spiral nerves. It is needless to say that the interdigital fossæ are nearly always sacred to scabies.

But many interdigital eruptions closely simulate true scabies. The skin of the region is thin and delicate, and perhaps for this reason children are especially prone to vesicular rash between the fingers. Cheiro-pompholyx, as well as many trade diseases, affect the interdigital fossæ. Amongst these are such forms of eczema as grocer's itch and miller's disease. Arsenic may induce such an eruption in bronzers and in artificial-flower makers; whilst certain plants, such as the *primula obconica* and the *ampelopsis*, have been known to attack the finger spaces of florists and of gardeners.

VIII.

FORM.

GENERAL CONTOUR OF THE HAND.—There is seldom a great deal of subcutaneous fat found in the hand. Hence its absorption is not followed by such a marked change as is seen in parts of the body freely supplied with adipose tissue. The alterations caused by age and by those forms of toxic neuritis which accompany gout, rheumatism, &c., are due in part to outgrowths, in part to perverted muscular action; also largely to a true atrophy of the skin, which is always affected in these diseases. Another cause of the change of form seen in the hands, is the slowly progressive shrinking of fibrous tissue which has been the site of lymph effusion, itself due to a great variety of causes, includ-

demonstrated that rheumatic fever is an acute infective disorder, affecting certain pairs of joints in a regular order whilst running a definite course. Friedländer asserts that the specific germ, or its toxines, acting in the medulla oblongata, cause rheumatic fever. The same germs, transferring their action to the cortex cerebri, would induce chorea. Without knowing the observations of Friedländer, which were not brought to my notice by Sir Dyce Duckworth till 1894, I had in the interim put forth similar views in the "International Journal of the Medical Sciences," Feb., 1892, Vol. XI., p. 132.

Dr. Dale had, quite independently of me, enunciated the same idea in an article on "Chorea," in the "Lancet" of Nov., 1891. So that this theory of the identity of some forms of rheumatism and chorea was already "in the air."

Later, I discovered that Ludwig Hirt, of Breslau, had in a work called "Nerven Krankheiten," Leipzig, 1890, already asked the question: "Is chorea caused by rheumatism, or is rheumatism caused by chorea, or are they the results of a common factor? No doubt the last of these views is correct. THERE IS A RELATIONSHIP OF ETIOLOGY. If an injurious agent exert its influence by way of the brain, chorea is the result. If, on the other hand, it act in or on the joints, rheumatism ensues."

Dr. David Drummond, later and quite independently, put forth the same idea in the plainest way, in his clear and far-seeing "Address on Medicine," delivered at the annual meeting of the British Medical Association, held at Newcastle-on-Tyne, on August 2nd, 1893.

Rheumatic gout and chronic rheumatism must be viewed as including a vast number of different pathological processes, having either chondritis or synovitis in common. It cannot be too often repeated that *rheumatism is merely a symptom, and is not a true pathologic entity.*

Chronic rheumatism, including rheumatic gout, may arise

from an infinite variety of causes—overwork and under-feeding, as in the London cab-horse and the agricultural labourer. There is always some predisposing toxic condition. Even in the labouring man, carious teeth, bad drainage, inadequate and adulterated food and drink, often play a part.

The toxic conditions may be conveniently considered as autotoxic and heterotoxic.

The word "autotoxis" may be reserved for poisons produced inside the body. This would include the toxins of the apathogenic, normal bacilli, such as the bacterium coli commune. This distinction is, of course, artificial and arbitrary, but for the present it has certain conveniences. Alcoholic arthritis is usually called "gout." This is more especially the case if it chance to occur in a wealthy patient. Alcoholic, arsenical and saturnine chondritis, are undoubted examples of heterotoxis.

Rheumatism due to the absorption of products of food-fermentation in a dilated stomach and of fæces from a torpid colon, are instances of autotoxis. Add to these the easily-overlooked family of poisoning by pus-products, including the case of tonsillar calculus, the empyemata, carious teeth, leucorrhœa in women and neglected gleet in males.

I am greatly interested to learn that Mr. Dudley Wright has noted in some cases of acute pre-rheumatic amygdalitis, the presence of small calculi, surrounded by purulent material, in the tonsillar crypts. Thus foci are formed for pus-absorption and general infection. This is a valuable contribution to the solution of the long-vexed problem: What is the relation existing between tonsillitis and rheumatism? There are other relations, for I have observed, after an attack of influenza, arthritis in the area of the supply of the left median nerve, herpes in the course of the right median, and herpes of both tonsils—simulating acute caseous tonsillitis; all occurring in the same subject. Dr. Archibald Garrod, too, describes acute erythema of the gullet as pre-

ceding rheumatic attacks. These are, without doubt, general toxic invasions, in which the arthritis is only one part of a general pathological picture. In fact, quite a fortuitous and secondary part.

We may note, that Heberden in his original treatise, definitely states that the phalangeal manifestations observed by him did *not* occur in the subjects of gout. By the word "gout," Heberden, of course, did not mean either arteritis or lithiasis: he undoubtedly meant podagra acuta, or "frank" gout. I will ask the reader to note the highly interesting point, that Bouchard found so great a proportion of cases having enlarged proximal phalangeal joints in his examples of dilated stomach. (See Fig. 1, p. 13.) This has been confirmed by the writer. It may be added that it is the terminal phalangeal articulations—acroarthritis—which are usually found affected after oral or pelvic suppuration.

It is of interest to remember that whilst gout shows a marked preference for the hallux, the corresponding pollex, so frequently selected by cerebro-spinal disease as a commencing site, often entirely escapes the attacks of rheumatism and its allies. A notable exception is Fortescue Fox's "thumb-base arthritis," usually traumatic. Here the palm becomes cupped and the freedom of thumb-play is gravely impaired.

Exostoses usually commence as degenerative changes in the cartilage. Those due to gout are often central, attacking the middle of the phalangeal trochlea (see Fig. 7, page 29). They are frequently unilateral; that is to say, confined to one side of the body. They may be solitary. Rheumatoid changes, on the other hand, are usually multiple; and though rarely symmetrical, are most frequently bilateral (see Fig. 8, page 29). This asymmetry accentuates the grotesque and hideous deformities seen in advanced cases of osteo-arthritis.

In the so-called "strumous" hand, the joints are thickened, whilst the fingers are slender between them.



FIG. 9.

CASTS OF HANDS OF MONGOL IDIOTS, SHOWING CURVE OF LITTLE FINGER.



FIG. 10.

SKIAGRAPH OF MORGAN. 1900.



FIG. 4.

HANDS IN POSITION OF PRONATION, SHOWING CURVE OF LITTLE FINGER.



FIG. 10.

SKIAGRAPH OF MONGOL HAND.



FIG. II.

STUNTED HAND OF CONGENITAL CRETINISM. ¹

(TELFORD-SMITH.)





PLATE 10
THESE ARE THE REMAINS OF THE
(C. 1800-1850.)

Muscular distortions, due to paralysis of the intrinsic manual muscles, such as the *main en griffe* of Duchenne, and those due to paresis of the extensor muscles of the fore-arm, as the wrist-drop of house-painters, usually owe their origin to centric changes in the nervous system.

The general shape of the hand, and the special form of the finger, often afford considerable aid to diagnosis.

In an article published in "Pediatrics," on Oct. 1, 1896, Dr. Telford-Smith, of Lancaster Asylum, draws attention to a peculiar formation of the hand occurring in so-called Mongol idiots. Idiots of the Mongol type get their name from their remarkable facial resemblance to the Mongolian branch of the human family—a resemblance pointed out by Dr. Langdon Down in 1866. (See Bibliography). Numerically they form a group, which Dr. Shuttleworth estimates at about 5 per cent., of mentally defective children. They appear to be particularly prone to tuberculosis. It has been suggested by Rayner that this termination, "phthisis," common to such widely differing diseases as idiotcy, epilepsy and leprosy, is explained by their being shut up together, often without air or exercise.

The condition is invariably congenital, and is probably a kind of cretinism.

The peculiarity in the shape of the hand, to which Dr. Telford-Smith calls attention, exists in the little finger, and consists in a marked outward bowing or curve of this finger.

This curve is fairly well shown in the accompanying reproduction from a photograph of casts of hands taken from two Mongol idiots.

The skiagraph (Fig. 10) was taken from one of these hands. From it we see that the second phalanx of the little finger is considerably shorter than normal, whilst there is much lateral displacement of the terminal phalanx.

Amongst the most typical variations are the stunted hands of congenital cretinism (Fig. 11); the spade-shape of

myxœdema (Fig. 12); the sausage-shape of acromegaly (Fig. 15); the carrot-like fingers of rheumatoid arthritis (Fig. 13); and the clubbed fingers of mitral disease and of pulmonary suppuration, more especially of Marie's pulmonary hypertrophic osteo-arthropathy. (See Figs. 14 and 17).

§ IX.

CLUBBED FINGERS.

Long ere the refinements of modern diagnosis, which followed the introduction of instruments of precision, by Laennec, Simpson, Recamier and others, clubbing of the finger-ends had been observed. It was held to be an important sign of "consumption." But this condition is not confined to consumption. It occurs sometimes in the course of bronchiectasis. Patrick Manson has seen it as a sequel to the evacuation of hepatic abscess by way of the respiratory passages. It has been described as a result of congenital heart-disease. It is seen after nerve-injury, pneumonia and spinal caries. No single factor, shared alike by these widely-differing conditions, has as yet been made out. The matter is probably largely mechanical. The finger-tip is the point of least resistance; it is not supported like the toes by boots. Venous and lymphatic flow may be both obstructed, whilst vaso-motor paresis is often present.

Dr. Vivian Poore has recently republished his Bradshaw Lecture of 1881, entitled "Nervous Affections of the Hand." He has ably treated this subject in a most thoughtful paper, drawing attention to the fact that clubbing is absent in patients whose legs are swollen with tortuous veins, nor is it always present in bronchiectasis with emphysema, where there is considerable venous stasis; to this we may add that clubbing forms no part of the phenomena of Raynaud's disease.

Dr. Poore describes the case of a lady of 50, who sustained a severe injury of the brachial plexus on one side. It was



the first of these is the fact that the
the second is the fact that the
the third is the fact that the

the fourth is the fact that the
the fifth is the fact that the

the sixth is the fact that the

the seventh is the fact that the
the eighth is the fact that the
the ninth is the fact that the
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the eleventh is the fact that the
the twelfth is the fact that the

the thirteenth is the fact that the
the fourteenth is the fact that the

the fifteenth is the fact that the
the sixteenth is the fact that the
the seventeenth is the fact that the

the eighteenth is the fact that the
the nineteenth is the fact that the

the twentieth is the fact that the



FIG. 12.

MYXEDEMA.
(SAVILL.)



Fig. 16

ARTHRITIS DORSALIS.





FIG. 13.

RHEUMATOID ARTHRITIS.





FIG. 14.

PULMONARY HYPERTROPHIC OSTEO-ARTHROPATHY.
(After Massalongo of Verona.)

Here the nails serve to distinguish the disease from Acromegaly. In Marie's disease, they are broad and smooth, NOT OVERLAPPED BY SKIN.



FIG. 14.

OSTEOARTHRITIC OSTEOPATHY.
 (Hand of a Negro of Verrill.)
 The hand is from a Negro of Verrill. In this case, the
 joints are not overlaid by skin.

afterwards found that the fingers on that side were covered with scurf and affected with chilblains. The nails grew dead and white, and they were harsh in texture. Glazed spots appeared at the root of the finger-nails, whilst well-marked clubbing set in on the side of the traumatism.

A very complete bibliography of the subject may be found at the end of a capital monograph by Massalongo of Verona. It is in Vol. X., M., of the "Policlinico," published at Rome in 1897, by the Societa Editrice Dante Alighieri.

It is curious that all the cases of Marie's disease that have been recorded up to the present time, have occurred in men. I have recently seen a woman of 35, suffering from a second attack of spinal caries. She had Pott's disease at 14, and is now much disfigured by the so-called "angular curvature." There is, however, no trace of Marie's disease in the finger-tips; perhaps this is because the respiratory organs are not yet invaded by tubercle.



FIG. 15.
ACROMEGALY IN THE ADULT.
(HARRY CAMPBELL.)

Dr. Harry Campbell has pointed out a curious resemblance between the normal condition of the gorilla and the acquired bone and skin changes of the acromegalous subject. Many of the morbid signs in this disorder, first described by Marie in 1886, are examples apparently of reversion to a primitive arboreal type.

This is seen by comparing the acromegalous hand, with the accompanying woodcut of a gorilla's upper hand, taken from Hartmann.



FIG. 16.

GORILLA'S UPPER HAND.

(TAKEN FROM HARTMANN.)

The writer is indebted to the courtesy of Dr. Fisher, of King's Langley in Hertfordshire, for the opportunity of



FIG. 17.

CLIPPING OF THE FINGER-TIPS, IN A BOY OF 14, WITH MARIE'S DISEASE.

seeing a very typical case of Marie's disease in the wards of the West Herts Infirmary.

The patient was a boy, aged 14, with a well-marked angular curvature of the spine. There was a discharging sinus near the free extremity of each lower floating rib, forming the drainage from extensive spinal caries. The disease, undoubtedly tubercular in character, was as usual attributed to a blow; the child had fallen on its back at the age of 11 months. This may, of course, have been the immediate or exciting cause of the suppuration.

This boy measured thirty-six inches only in height, and was greatly emaciated. The point of the nose, the lobules of the ear, and the ends of the long bones were all much enlarged. The nails were not much hooked, but the fingers and toe-tips were clubbed and deeply cyanosed. The accompanying illustration (Fig. 17), shows the smooth, broad, flat and thin glazed nail and the clubbed fingers.

Curiously enough, in the next bed lay a man of 30, convalescent from pneumonia, who showed well-marked clubbing. Tubercle bacilli could not be found in his sputa.

This clubbing of the digital pulp is not to be confounded with hooking of the nail. Though these may exist together, they are quite distinct conditions; their respective causes and relations require careful working out.

§ X.

SECRECTIONS.

There is another important change in the skin seen after peripheral neuritis, which has not received quite its fair share of attention; I refer to the modification of function in the fat glands. These no longer secrete the normal sebum—a thin colourless oil. At first they begin to sluggishly pour out a thicker secretion, of no use for emollient purposes.

This change itself is said to be due to a thickening of the fat-follicle, impairing the blood-supply. This thickening, like the accompanying hyperkeratosis of such parts of the plantar surfaces as are especially exposed to traumatism, is a common sequel of neuritis. At a later stage, the sebaceous follicles either perish, sharing a general atrophy of the derma or true skin, or else they join the sweat glands proper in pouring out a perspiration, more or less modified in its physical qualities. Thus are brought about the changed conditions now recognised as hyperidrosis and dysidrosis. This replacement of the natural silkiness of the skin by a harsh and parchment-like condition, at times alternating with a swampy and sodden state of things after exertion or emotion, is well seen on the legs of subjects of gout, rheumatism, myxœdema and goitre. Two or more of these morbid groups are often found blended together in what Mr. Jonathan Hutchinson has so happily termed "the partnership of diseases."

In some instances the skin thickens, whilst in others it becomes thin, tense and furfuraceous; it is sometimes covered with silvery scales, looking like a case of recent scarlatina, passing through the process of peeling.

These cases derive prompt and often persistent benefit from the inunction, after a hot bath, of thyroïdin blended with some suitable lubricating material.

Dr. Kent Spender, of Bath, was the first in this country to draw attention, in 1885, to the fact that at some stage of the history of rheumatoid arthritis, the secretions of the skin are always disturbed.

ŒDEMA.—Persistent swelling of one hand, *without* discoloration, if acute, would suggest either peripheral neuritis or else traumatism higher in the limb. Obstructed vessels, venous or lymphatic, with or without glandular enlargement or other tumour, should be looked for in the axilla, whilst the possibility of aneurysm should be thought of.

Swelling, *with* discoloration, would on the other hand,

indicate either eczema, erysipelas, acute rheumatism or the action of some toxic agent, of animal or of vegetable origin.

Persistent swelling of both hands suggests albuminuria, from lead-poisoning or some other cause. If renal disease be at an advanced stage, then the dorsum of the hand rises like a pincushion, the swelling being pale in colour and of most characteristic form.

Uræmic puffing is dusky. When purple maculæ appear on the cutaneous distribution of the musculo-spiral nerve, they form a portent of the gravest nature, death seldom being long delayed.

It may be remembered that the mere swinging of the arms during a long walk is quite enough to cause temporary œdema of the hands.

§ XI.

SENSATION.

Such an infinite variety of causes lead to paræsthesia, or perverted sensation, of the fingers, that the needful limits of this paper quite preclude any attempt to give a complete account of them here. It will suffice to say that numbness in the superficial filaments of the median, in its digital distribution on the left side, is not necessarily a sign of heart-disease. It may mean fifty things. Amongst the commonest are that this deadness of the left hand, more particularly when it occurs in the morning, may bear a relation to the posture assumed during the night, to the nature of the evening beverage, or to the habit that some have of uncovering the left arm when asleep. It may be acroparæsthesia, and may pass on into acromegaly. It may be toxic from tea, tobacco, strychnine or digitalis. One of the most typical cases that I have seen occurred in the wife of a

professional brother, who practises in the north of London. After an attack of influenza, all her finger-tips became rosy and swollen. The pulps were so exquisitely sensitive that she shrank from the lightest contact. This condition resisted every kind of treatment until the patient took twice a day a tablespoonful of old Madeira, with an equal quantity of Invalid Turtle in hot water. Then she immediately got well. Numbness may be hysterical or else mimetic. It has been known to disappear under the use of digitalis, apis, aconite, and tincture of St. Ignatius's bean, the salicylates and the bromides, more especially the bromide of ammonium.

With regard to multiple or peripheral neuritis: it is now the fashion to call everything "neuritis"; but this is not justifiable, unless there be a history of œdema, with sometimes a vesicular rash, paræsthesia—either burning pain or else numbness—and loss of function, especially of coördination, diminished, myotatic sensibility, followed by changes of skin temperature, tint, texture or secretion, more especially by certain trophic modifications as muscle-wasting. Without these phenomena, a case should not be looked upon as one of typical "neuritis." Many of the varied conditions known as "rheumatism" are different species of neuritis, usually toxic when polyarthritic; often traumatic—as pointed out by Fortescue Fox—when confined to a single joint.

All the infinite forms of neuritis may cause deadness of one or both hands, especially those associated with gout, rheumatism, alcoholism, catarrh, tea and tobacco poisoning and the modern anodynes and narcotics.

To these may be added a variety of conditions causing either general traumatism, or else local pressure on the origin or course of the median nerve.

Widely different is the clinical significance of persistent numbness in the ulnar distribution. Comparatively few diseases are associated with loss of sensation in the little finger. Prominent amongst them are leprosy, some forms of tabes, and general paralysis of the insane.

The aura of true epilepsy usually starts from the upper extremity, rarely from the trunk. In the various imitations of true epilepsy, the aura rarely begins in the arm, most usually in some part of the trunk, usually the dorsal region.

It is scarcely needful to say that invaluable evidence of present or past lesion of cerebro-spinal origin may be derived from a study of the hand. This branch of the subject has already received such careful and complete consideration at the hands of competent writers, that it is needless to do more than give a brief outline of the most important types here, and then refer the reader to certain valuable monographs, more especially to a paper by Francis Warner, "On Postures of the Hand in Brain Disease"; and to one by Long Fox, "On the Hand as a Diagnostic Factor in Diseases of the Nervous System."

§ XII.

MOTION AND WANT OF MOBILITY IN THE HAND.

The subject of hand-movement may be conveniently treated in two sections:—

- (1) Motion modified.
- (2) Motion lost.

HAND-MOTION MODIFIED.

First.—Perverted Movements of the Hand.

TREMORS.—First; as to the early and easy detection of finger-trembling. During the incipient stage of their existence, that is to say many months before they force themselves obtrusively on our notice, fine tremors may be detected in the following way. We direct the patient to stretch forth the arms, widely dividing the digits, at the

same time closing the eyes and then to count audibly. Now, if we watch closely, we may note in mild and recent cases, that for obvious anatomical reasons, the ring-finger is the first to shake. At a later stage, the trembling is propagated to the other digits. Too much importance should not be attached, either, to the direction of the tremors; that is, whether they be antero-posterior or lateral, to their force or to their frequency. It has been said that the tremors of goitre are fine, frequent—eight or nine in number to the second—and always antero-posterior in direction; whilst those of alcoholism and paralysis are coarse, lateral and infrequent. But this matter has been over-refined; there exists no absolute rule.

The presence of tremor suggests *injury*, more especially toxic or traumatic, to the motor tract; paralysis, on the other hand, suggests *destruction*.

The subject of tremblings has received a good deal of attention in France. Notably M. le Filliatre (*vide* "Bibliography of Tremor"), has devised an ingenious method of recording the variations and frequency of tremors on a tambour. Not that the subject has been ignored in this country, where Paralysis agitans was first described in 1817. Indeed, it is known on the continent even now as Parkinson's disease.

Some very good work has been done in England by Wolfenden and Dawson Williams. (See "Bibliography of Tremor.") These gentlemen have demonstrated a very interesting point, namely, that tremors are usually twice as frequent as they appear to be. According to these observers, the tremblings are dicrotic, consisting of one larger and one smaller movement. Of these only one, the larger, is usually recognised. Hence the frequency has been estimated at about five oscillations per second, by able observers like Gowers and Marie, whereas Wolfenden and Williams say that its average is just twice as many, namely, 10.2 to 10.4.

The factor of age is of such moment that the whole question will be first considered under the headings:—

- (a) Tremors in Childhood.
- (b) Tremors in Mature Life.
- (c) Tremors in Old Age.

IN CHILDHOOD.—Some children are born with tremulous fingers. They pass through life with shaky hands, and they seem little the worse for it.

Tremors do not appear to bear the same relation to chorea as *petit mal* does to true epilepsy; for the movements in tremor are typically rhythmic, whilst those of chorea are as essentially irregular. Tremor is probably merely a perversion and exaggeration of normal myotonic contractions.

I have never seen any kind of drug treatment improve the congenital tremors of childhood.

IN MIDDLE LIFE.—At this time, a very large proportion of the tremors are toxic in their character.

In men, the abuse of alcohol and tobacco are amongst the common sources; whilst in women, mental emotions, the over-use of tea, of medicated wines, and the absorption of products which are the result of functions peculiar to their sex, play an important part. In both sexes, the possible introduction into the body, either by accident or by design, of such agents as arsenic, cocain, chloral, lead, mercury or opium is to be thought of.

Other common causes are terror, sexual excess, starvation and exhaustion—either mental or else physical. The secretions of the ductless glands appear to be needful as anti-toxins, as well as direct stimulants to tissue growth and repair; their absence leads to tremor, associated with acromegaly, Graves' disease, Addison's disease, cretinism and myxœdema, according to the gland affected.

When we speak of rheumatism, gout, glycosuria, albuminuria, Graves' disease, malaria and syphilis as etiological

factors, we should do well to remember that the immediate cause of the tremor is often toxic.

When we contemplate the results of terror, of traumatism, of sexual excess, or of the exhaustion caused by extreme fatigue, even in these instances there is possible in the neuro-muscular apparatus a *plus* of tissue-poisoning by retained metabolic material, as well as a *minus* caused by innutrition.

We may recall a valuable clinical feature in diagnosing the alcoholic tremor of women—a subject demanding much tact and delicacy,—that, according to Buzzard, *neuritis alcoholica* is usually associated with amenorrhœa, without pelvic explanation.

IN OLD AGE.—In advanced life, some amount of tremor may be regarded as nearly normal. The hand of every old man shakes. In age we revert to the normal unrest of childhood, itself an evidence of absent control, a wavering allegiance being rendered to a nervous system, unstable from imperfect development. The muscles run riot in early life, passing readily into the choreic condition. In extreme youth, the muscles do not elect to rest—in old age they cannot repose.

Senile Tremor does not mean only that the nervous or muscular systems have failed; it is of course a matter of general and widespread degeneration; yet the shaking is more immediately related to that innutrition which comes of arterial atheroma, physiologically present after mature life.

Senile Tremor may of course be accentuated by the various results of excess committed at an earlier period. At this stage, little can be effected in the way of treatment. We may do our best to protect the patient from aneurysm, from intra-cranial hæmorrhage and from senile gangrene. Anything like a permanent cure is of course quite out of the question.

Senile Tremor, reaching its extreme point in Parkinson's

disease, must be viewed as natural decay. Those peculiar movements of the hands which precede death, known as carphology, literally "straw-gathering," have been so graphically described by the Greatest of English Dramatists, in his life-like portrait of the last moments of the dying Falstaff, that they need not be more than referred to here.

PARALYSIS AGITANS (Parkinson's disease).—A disease of advanced life, essentially chronic and progressive. This disorder is so definite, that no description of it is needful here.

There is no pathology of Parkinson's disease; nothing whatever is certain as to its causation. Unknown in youth, rather more frequent in men than women, paralysis agitans is a descending disease, accompanying the vascular changes of senility. We take it, then, that it is one of the results of degenerative arteritis, increasing the normal unperceived movements of the hands. That the hands are always moving in every person in health, has been shown by the ingenious observations of Dr. Percy Wilde.

In the *Edinburgh Medical Journal* for 1881-2, there is an interesting account of an instrument, devised by Dr. Percy Wilde to record these normal involuntary movements of the hand. By means of this contrivance, he has recorded some curious facts. When apparently at rest, the hands move laterally. Automatic movements which are centrally initiated usually start during expiration and follow the direction from right to left. Some remarkable tracings are given at p. 293, of the effects on the hand-movements of respiration, cough, shock and laughter. Dr. Wilde describes two sets of unconscious hand-movements. They are:—

Normal and	$\left\{ \begin{array}{l} 1. \text{ Respiratory} \\ 2. \text{ Circulatory} \end{array} \right\}$	$\left\{ \begin{array}{l} a. \text{ insp.} \\ b. \text{ exp.} \end{array} \right\}$	Involuntary.
Abnormal	$\left\{ \begin{array}{l} 3. \text{ Nervous} \\ 4. \text{ Reflex Muscular} \end{array} \right\}$		Involuntary or Semivoluntary.

There are certain points of resemblance between Parkinson's disease and general paralysis of the insane. In view of this alliance, it is of extreme interest to note that Dr. Mott, the pathologist to the London County Asylums, has shown good reason for suspecting that general paralysis is an autotoxis. This is highly suggestive as to the nature of paralysis agitans.

Dr. Mott's results are confirmed by some very valuable work recently done in the States by Dr. Beattie Nesbitt. (See Bibliography of Tremor.)

Paralysis agitans is distinguished from St. Vitus's dance, rare in the aged, by the rhythmic character of the movements; they are always irregular in chorea; whilst the hereditary form of chorea, commonly known by the name of its first describer (Huntington), like epilepsy, ends in madness. It is to be regretted that Huntington called this disease "chorea." In paralysis agitans there is generally a histrionic element present, as anyone can convince himself who will take the trouble to observe the typical examples to be found seated on sunny days in busy West-end thoroughfares, turning handles and setting going mill-wheels and other fascinating objects suggestive of rural life! If the passer-by will stand not too near and watch these good men carefully, he will note a curious fact. It is that the vigour of the tremors bears a direct relation to the number of spectators present. Yet the disease is a genuine one: witness the curious running gait and the inability to perform duties involving nicety of touch, however agreeable they may be. In addition to the odd procursive gait, the high-pitched, slow, and somewhat monotonous speech, the pronated fore-arm and the constant friction of the forefinger on the thumb, as if it were attempting to rub the skin off that digit, these signs are quite characteristic and by no means easy to simulate.

This disease is distinguished from syphilis of the cord by retention of function-control. From multiple sclerosis, by

absence of nystagmus, of intention in the tremor and of paræsthesiæ.

Meanwhile it becomes an important matter to distinguish between physiological and pathological trembling.

The chief forms between which we are required to differentiate, are the toxic and the tabetic tremors. Of course they may be seen occurring together. The subject of syphilis may quite possibly have been also a drunkard. The great points to observe are that in the toxic cases, the reflexes may be exaggerated, whilst the muscles are not materially wasted.

In the tabetic conditions, on the other hand, muscular atrophy is usually marked, coördination is faulty, and the reflexes are abolished.

Ocular changes are of the greatest possible importance. Modification of the areas of colour-perception, points to "hysteria." Optic neuritis would suggest sclerosis or else saturnism. Retinal cedema follows alcoholism. Atrophy, with hæmorrhages, renal degeneration. The presence of the Argyll-Robertson sign, that is a contracted pupil which dilates for distance but not for darkness, would serve to distinguish sclerosis from lead-poisoning.

Having treated of Tremors in their relation to age and sex, we may next consider the various forms of trembling, from a more systematic standpoint; noting especially their—

1. Distribution.
2. Degree.
3. Direction.
4. Frequency.
5. Rhythm.
6. Method of Advent, with Course and Duration.

Tremor is distinguished from chorea, another form of clonic spasm, by the smallness and regularity of the movements.

(A.) PARALYSIS AGITANS is usually accepted as a type. Here the tremors are small. They are rhythmical, and they are non-intentional; that is to say, they cease during muscular coördination for action. The face, the speech and the attitude are all most characteristic. It is a disease of the latter half of life.

(B.) SENILE TREMOR strongly resembles the preceding form, but only the head and neck are involved; rigidity and paresis are less marked and the condition is not necessarily progressive.

(C.) DISSEMINATED SCLEROSIS. Here the tremors are both rhythmical and intentional. Nystagmus and vertigo are present, whilst both the facies and the speech are more than suggestive.

(D.) GENERAL PARALYSIS OF THE INSANE.—The tremors are small. They chiefly affect the lips and the tongue. Muscular weakness is widely distributed. There are also grandiose mania and progressive loss of moral control.

(E.) SMALL HYSTERICAL TREMOR.—The shakings are fine and jerky. They are often confined to a small motor area. The age, the sex and the presence of the hysterical stigmata, all serve to aid the diagnosis.

(F.) MIMETIC TREMOR.—Conscious and unconscious.

(a.) Unconscious mimesis.

(b.) Conscious mimesis, either to attract attention merely or as a form of malingering, as in some mendicants.

(G.) NERVOUS TREMOR from muscular or nervous debility. The tremors are small and rhythmical, whilst other evidences of neurasthenia are present.

(H.) TOXIC TREMORS.

1. Metallic.
2. From nervines, as
 - (a.) Alcohol.
 - (b.) Tea.
 - (c.) Tobacco.
 - (d.) Morphia.
 - (e.) Cocain.
3. Other poisons as bisulphide of carbon, used in rubber factories.
4. Infective diseases.

1. **METALLIC TREMOR** caused commonly by lead, arsenic, mercury and zinc. The tremors are small, rhythmical and intentional; the classic signs of the respective kinds of poisoning will be present.

2. NERVINE TREMORS.

- (a.) Alcoholic are fine, rhythmical, intentional, hands and tongue worst; insomnia, dyspepsia, irascibility and mental depression are often present.
- (b.) Tea tremor.—Palpitation, flatulent dyspepsia, sadness, and polyuria, usually with pallor of the surface.
- (c.) Tobacco tremor is associated with sleeplessness, starting of the legs at night, ocular troubles, tachycardia, contracted arteries and anal irritation.
- (d.) Morphia tremor.—Constipation, scanty urine, dreams.
- (e.) Cocain Tremor is accompanied by irregular action of the heart, sleeplessness and terrible depression.

3. **INFECTIVE DISEASES.**—Amongst these the commonest are rheumatic gout, influenza, syphilis, goitre, ague and the pyrexial states.

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(I.) OTHER DISEASES in which tremor is present, but in which it forms a subordinate feature.

- (a.) Intracranial tumour.
- (b.) Lateral sclerosis.
- (c.) Friedreich's disease.
- (d.) Amyotrophic paralysis.
- (e.) Some forms of glycosuria.

TREMORS AND THEIR TREATMENT.

We have seen that trembling of the extremities may accompany a great variety of morbid conditions.

1. It is prone to occur in the course of diseases affecting chiefly the great nerve-centres.
2. It may be present in disorders primarily developed in the peripheric distributions.
3. We see tremor after acute general affections of centre and periphery.
4. It is often associated with blood-states involving no distinct nerve-lesion.

TREATMENT.—The first indication obviously is to remove the exciting cause or causes, for they are generally complex.

All the nervines must be strictly and absolutely interdicted. Rest, so valuable in chorea, is of equal importance in the treatment of tremor.

Healthy tissue-metabolism may be promoted by copious draughts of cooked milk, or some harmless diluent. Careful lung exercises with general gentle electro-massage, using attenuated voltaic currents, commencing with a single milli-ampère.

Electric and Turkish baths; and, of course, plenty of open air, without exertion.

The diet to be very plain; meals frequent and consisting of easily assimilable forms of food.

Certain drugs aid the cure, but they must not be frequently changed, for a rapid result should not be looked for.

For tremors with marked depression of mind, tincture of *cimicifuga* is useful. For trembling as a result of over-exertion or traumatism, *arnica* or *hypericum*, followed by *chalybeates*, may be thought of. In sexual tremor with impairment of the powers of the mind, *anacardium*, *cinchona* and phosphoric acid have proved useful. In alcoholic tremor, *nux vomica*, *ignatia* and sulphur are good; whilst the sleeplessness so often associated with this form is helped by *antipyrin*, *trional*, *gelsemium*, *phenalgin* and *sulphonal*. I have found most valuable for the alcoholic craving, a drachm of *tinctura cinchonæ rubræ* in a glass of Scheweppe's dry ginger-ale, or a tablespoonful of Flitwick taken in a glass of lemonade—by this I mean lemon-juice with water and not the lemonade of commerce. Should these fail, hypnotism may be thought of as a last resource.

Autotoxic tremors associated with a lazy liver, torpid colon, or a dilated stomach, are often greatly benefited by a brisk mercurial purgative, especially by calomel or *hydrarg. cum cretâ*. In these cases a full dose, once or twice a week, is followed by much more satisfactory results than a smaller quantity frequently repeated.

If the stools be wanting in colour, *aconite* or one of the liver stimulants may be added. If *pruritus ani* be present, tobacco must be sternly forbidden; a tablet of thyroidin, every day after breakfast, often removes both the tremors and the anal irritation. A further reference to the treatment of Tremor will be found in the following section.

HAND-MOTION LOST.

There are three kinds of Abolished Movement :—

- (a.) Paresia.
- (b.) Paralysis.
- (c.) Contracture.

The chief forms of modification of movement which we encounter clinically in the hand are :—

1. Post-hemiplegic contracture.
2. Progressive muscular atrophy.
3. Amyotrophic lateral spinal sclerosis.
4. Ulnar paralysis.
5. Musculo-spiral paralysis.
6. Median paralysis.
7. Tetany.
8. Paralysis agitans. (See Tremor Section under Motion Perverted, pp. 45-8).
9. Peripheral neuritis, including gout, rheumatism and their allies, with certain other more directly toxic conditions as lead-poisoning, &c.

It would be altogether outside the scope of a work on "The Hand," to detail the distinctive signs and the clinical histories of these varied conditions. It will be enough to give a brief sketch of the more ordinary types.

The meaning of some of the chief changes in the form of the hand will be noted here. Digital stiffness, especially in adult men, with atrophy of the balls of the little finger and thumb, without rheumatic or gouty change, inability to perform the delicate manipulations involved in writing, shaving, buttoning the collar, more especially in cold weather, should suggest atrophy of the thenar and hypothenar muscles and of the interossei, and should at once make us

think of the possible commencement of progressive muscular atrophy. This condition may be recognised long before the presence of the *main en griffe* of Duchenne—the so-called “claw hand”—forces the diagnosis upon us.

It will be observed that the hand of lateral spinal sclerosis resembles somewhat the wrist-drop of musculo-spiral paralysis, as from lead-poisoning. But this resemblance is quite superficial; these conditions could never be clinically confused.

The distortion of sclerosis is a contracture. Efforts to remove this and to straighten the fingers, cause pain and are strongly resisted. With regard to the wrist-drop of lead-poisoning, all this is reversed. The saturnine distortion is a true palsy, and there is no resistance to an effort, made from without, to restore the member to its normal attitude.

1. POSTHEMIPLEGIC CONTRACTURE.—This condition is so typical, whilst the clinical history is so patent, that we need not stay long to consider it. Excepting in the case of the thumb, the digits are contracted at their distal, whilst they are extended at their proximal joints, the hand is pronated and the thumb often adducted.

2. PROGRESSIVE MUSCULAR ATROPHY starts in the ball of the thumb, the so-called “thenar eminence.” Unlike the last form, it is bilateral, often symmetrical; there is marked muscular wasting, with prominence of the osseous outlines, fibrillary twitchings and a lowered local temperature. It is *not* hereditary. It has to be distinguished from osteo-arthritis and from lead-poisoning, which also affect the thenar muscles. It is easily differentiated from acute anterior polio-myelitis (infantile paralysis), in which disease, paralysis precedes atrophy. In progressive muscular atrophy, the muscle-wasting proceeds *pari passu* with the paralysis.

3. AMYOTROPHIC LATERAL SPINAL SCLEROSIS.—The hand is strongly flexed on the fore-arm, the fingers firmly flexed on the palm, the thumb drawn in. Attempts to straighten the digits, causing considerable pain, are strongly resisted. There

are fibrillary twitchings, either actually present or else quite easily excited. In course of time, marked muscular atrophy forms a feature of the case. This disease has to be distinguished from syringo-myelia and Morvan's disease, both of which may be imitated by leprosy.

Common to all forms of lateral sclerosis are excessive myotatic irritability (that is exaggeration of the tendon reflexes), spasm, rigidity, paralysis and a certain amount of tremor. If the tremor be very pronounced, then the possibility of disseminated sclerosis or of cerebral tumour, should be borne in mind; the latter being either in the parietal region or else near the optic thalamus.

4. ULNAR PALSY.—Paralysis in the ulnar distribution is, if sudden, nearly always traumatic. In the East, it is a well-known sign of leprosy; also it is said to accompany certain forms of insanity, more especially paralytic dementia or general paralysis of the insane. The onset in all these would be gradual. (See Bibliography of Ulnar Anæsthesia.)

If the lesion be *below* the wrist, adduction is imperfect, because the flexor carpi ulnaris no longer acts in unison with the extensor carpi ulnaris. Bending of the hand is badly done by means of the radial flexor of the wrist, supplied by the median. Movement in the little finger is almost entirely abolished. Complete flexion of the inner three fingers is rendered difficult, at times impossible. The fingers cannot be separated nor firmly pressed together. This is due to paralysis of the interossei; whilst flexion of the first phalanx and extension of the two terminal phalanges of all the fingers are, for the same reason, rendered impossible.

When the ulnar is paralysed *above* the wrist, we get the "claw-hand"; and for this reason, injury to the ulnar might be mistaken for progressive muscular atrophy, but that the former is usually sudden and unilateral, whilst the latter is nearly always symmetrical and chronic.

5. **MUSCULO-SPIRAL PARALYSIS (Wrist-drop).**—The musculo-spiral is an unfortunate nerve. It is more frequently affected by paralysis than any other nerve in the upper extremity. It is the custom to explain this by saying that it is more exposed to traumatism. But this will not give any solution to the problem why do palsies of centric origin disturb the musculo-spiral more than the other nerves of the upper extremity? Most of the peripheral neurites, more especially the toxic forms, such as those caused by lead, alcohol, arsenic, silver, iodine, pus and urine show their especial effects in the radial area. There are some notable exceptions to the rule that most diseases elect the distribution of the musculo-spiral, namely general paralysis of the insane, leprosy and some forms of tabes. As we have seen, these prefer the ulnar area.

6. **MEDIAN PARALYSIS.**—When paralysis of the median nerve exists, the second phalanges of all the fingers and the third phalanges of the index and middle finger cannot be flexed. The thumb can neither be bent nor opposed to the little finger. On the other hand, flexion of the first phalanx with extension of the other two, can be performed in all the fingers by the aid of the interossei, which are supplied by the ulnar nerve. The position of the thumb is peculiar; it is extended and adducted, lying closely applied to the index finger, as in the anterior hands of the anthropoids. When flexion at the wrist is attempted, the hand is strongly adducted by the action of the flexor carpi ulnaris, because the antagonistic muscle of the radial side is paralysed. The act of pronation of the hand is seriously impaired. The inner three fingers can be bent slightly, since the deep flexor of the fingers is supplied in part by the ulnar nerve. These combined effects give to the hand and fingers, especially to the thumb, a position so peculiar that median paralysis could scarcely be mistaken by an anatomist for any other deformity.

When the paralysed muscles begin to show the results of atrophy, the deformity in the fore-arm and in the ball of the thumb, will farther assist in the diagnosis of this affection.

7. TETANY.—In this disease the fingers are flexed, the thumbs adducted. It is sometimes seen after catarrh, influenza and hyperlactation in adults, but is practically confined to children as far as this country goes, and nearly always as an expression of rickets. *Tetany* must not be confounded with *tetanus*—quite a different state of things. For this reason the name is unfortunate and might well be changed.

In tetany, dorsal œdema of the hand is seen. The muscles respond to Faradic stimulation and contraction of the orbicularis of the eye on stroking the face—Abercrombie's sign—is present.

The fact that this disease has so often followed artificial athyrea, is a strong suggestion for the cautious use of thyroïdin in its treatment. The treatment must of course include that of rickets.

Acute Hydrocephalus, unknown as a primary idiopathic disease, is nearly always tubercular. The thumb is often clenched across the hand. Pupils are at first contracted but they afterwards dilate, as coma is developed. Distinguished from tetany by the retracted abdomen and by the fitful vomiting; by headache, with solitary cry and with the cerebral pulse.

8. PARALYSIS AGITANS.—It is customary, on account of its unfortunate name, to place this curious disorder amongst the palsies. This would do so great a violence to pathological propriety, that it has been placed amongst the Tremors. (See pages 45, 46 and 48).

9. PERIPHERAL NEURITIS.—Of the infinite variety of forms in which multiple neuritis may be revealed in the hand, it is impossible to treat here. We must be contented with a mere glance at the more ordinary types.

Many of the pains with which our forefathers were familiar under the convenient term "neuralgia," would now be recognised as examples either of neuritis or else of perineuritis.

A case should not be named perineuritis unless the trunk of the nerve be tender on pressure, as in some forms of inframammary pain, "brow-ague" and sciatica.

Many pains are doubtless called "neuritis" which are certainly not entitled to that term. The writer does not apologise for repeating this. We are not justified in styling a case one of "neuritis" when the classic signs of inflammation are conspicuous by their absence! This is undeniably true, more especially if we replace *pain*, in the old group of inflammatory tests, by paræsthesia or change of sensation. Complete anæsthesia is rare. *Colour* may be only slightly modified; *temperature* not much raised; *form*, at first, only altered if cedema occur; whilst *function* is nearly always disturbed. Classic signs of neuritis of a mixed nerve are, then, paralysis, followed quickly by atrophy, anæsthesia or pain, usually burning-smarting, with diminished cutaneous reflexes. *Gouty neuritis*, for example, changes the colour of the skin, which usually becomes more and more ruddy. Mr. Jonathan Hutchinson has said that gouty people start life with good teeth and strong nails. This is quite true, but, alas! the teeth get ground down and the nails atrophy, becoming ribbed or laminated. Acute neuritis in the gouty is usually associated with *numbness* rather than with *pain* in the hands. This is often followed by some persistent vasomotor disturbance; the fingers in consequence being either too hot or too cold. Sometimes we find one of two corresponding limbs hot and the other cold, a very characteristic sign of gout.

§ XIII.

OCCUPATION NEUROSES.

This group of Trade Diseases, which are sometimes characterised by spasm, such as Writer's Cramp, and sometimes by paralysis, as Scrivener's Palsy, may be conveniently considered here.

WRITER'S CRAMP.—In a masterly essay, entitled "Nervous Affections of the Hand," [Smith Elder, 1897], Dr. Vivian Poore (at p. 26) has shown that scrivener's disease is not a mere affection of the hand alone. The term "Writer's Cramp" by no means represents a single pathological entity; for any disease that affects the muscles of the right side of the trunk, or the right upper extremity, may be mistaken for writer's cramp. This is more especially true when there is impairment of the power of prehension of a small object, like an ordinary pen.

Dr. Vivian Poore has done good work in bringing it home to the reader that he must have the anatomy of the upper extremity, at his own finger-tips. Not the anatomy of an ordinary Manual—that is not nearly good enough—but a knowledge of the careful dissections of H. St. John Brooks and the minute observations of Duchenne de Boulogne.

Dr. Vivian Poore has brought the latter within the reach of the busiest practitioner, by rendering Duchenne's famous *Observations on the Hand* into fine fluent English, in his "Selections from the Clinical Works of Dr. Duchenne"; published by the New Sydenham Society in 1883.

Should we be consulted as to an "occupation neurosis," such as writer's palsy, pianist's cramp, sawyer's cramp, tailor's cramp, milker's cramp, telegraphist's cramp, or hammerman's palsy, a scrupulous search should be instituted for hemiplegia, either recent or remote; whilst overlooked left-handedness should not be forgotten.

Dr. Poore found amongst his three hundred cases, one

of paralysis of the serratus magnus, and one of aortic aneurysm!

In dealing with this group of diseases, the physician should look for signs of gout or of rheumatism. Especially for teno-synovitis, for tophi, for crepitating joints and for rheumatic nodules; also for perineuritis of the three nerve-trunks which supply the fore-arm. He should contemplate, too, the possibilities of autotoxis, as well as of heterotoxis. In a list of the former, purulent infection would of course stand pre-eminent. In the latter, tea, tobacco, alcohol, arsenic and lead. He would be on the alert to think of the results of chill, of influenza, of traumatism, of diabetes and of starvation.

TREATMENT.—The indications for treatment of an occupation-neurosis are:—

1. Perfect rest till all tenderness whether it be in muscle, in nerve-trunk or in tendon sheath, has entirely ceased. Some drugs, such as colchicum or salicin by day, and antipyrin at night, are often useful; whilst painting the trunk of the nerve with aconite or belladonna liniment, followed by hot compresses, themselves succeeded by swathing with Lairitz' pine-wool, will be found serviceable.

2. Electro-massage—at first very gentle—with the continued current, one milliampère being quite enough to begin with, the negative pole on the patient's neck, the positive pole being attached to a bracelet, worn on the surgeon's arm. Each muscle in turn is gently kneaded, nutritive cream being employed as a lubricant.

Nutritive cream consists of—

Oleum phosphoratum, gr. x.

Liquor thyroidei, ʒss.

Cremor frigidus, ad. ʒj.

It is well known that the positive pole of a Voltaic battery promotes endosmosis; and this, combined with the friction, helps the absorption of the cream, which has been found to be of great service in removing postneuritic

innutrition. In a prolonged sitting, it is well to employ the commutator, reversing the current occasionally. Each electro-massage is followed by gradually prolonged muscle-exercises with steadily increasing resistance. The injection of strychnia is sometimes useful, but as a rule a great deal too much is employed. It may be remembered that neither jaded nerves nor muscles should be over-stimulated.

If arterial tension be high and the arteries prone to contract, or if skin-asphyxia be present, Greville's thermic-baths are of considerable service.

Should the patient's means be limited and his employment precarious, these counsels of perfection may be quite out of the question. Can we then do nothing to relieve the sufferer, without financially ruining him by inflicting complete idleness upon him? Certainly we can; more especially if the disease be confined to the intrinsic muscles which move the fingers. We can, for mild cases, recommend a large cork penholder, or give him a Nussbaum's Apparatus for writing without the use of the digits, of which an illustration is here shown.

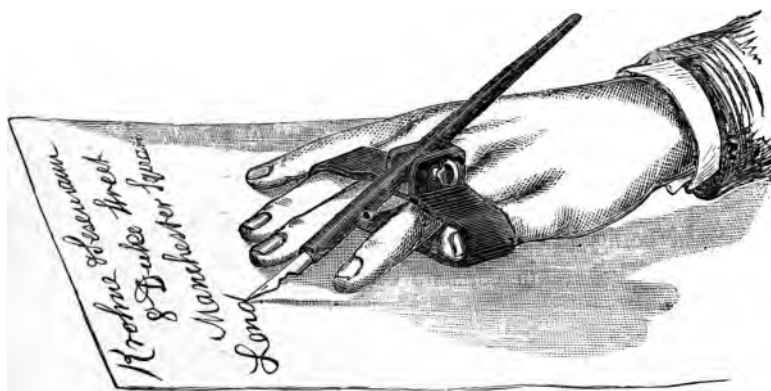


FIG. 18.

The energetic surgeon, Professor von Nussbaum of Munich, has devised a method of treatment which certainly deserves

trial, if only on account of its simplicity. Considering that, whatever the site of the malady, there is always a spastic contraction of the flexors and adductors, with a weak condition of the extensors and abductors, Professor von Nussbaum set himself to contrive a penholder that should be directed by the extensors and abductors, instead of by the flexors and adductors. This, he believes, he has accomplished in the use of what he terms a "bracelet." This bracelet is a stiff band of vulcanite, oval in shape, about $\frac{1}{8}$ in. thick and $1\frac{1}{4}$ in. broad, having a long diameter of about $3\frac{3}{4}$ in., and a short of $1\frac{1}{4}$ in. It is, therefore, wide enough for all five fingers to be slipped into it; but in using it, the thumb is only just entered, the fourth finger is entered almost as far as it will go and the little finger is left outside.

It is evident that the bracelet can be held firmly only by expanding the fingers strongly, that is by the use of the extensors of the first four fingers and the abductor of the thumb. To this bracelet the pen is screwed so as to be in contact with the paper when the hand lies on the table. The instrument is made in different sizes. In order to collect a large experience, Prof. von Nussbaum advertised in the newspapers, the gratuitous treatment of writer's cramp; he had accordingly a considerable number of well-marked cases. He states most absolutely that every one of these cases at once wrote easily and distinctly with this instrument, not a trace of spasm appearing in any one of them. All expressed themselves as feeling specially comfortable in using it, and some of the patients, after a time, acquired the feeling that they could again write in the ordinary way without fear of spasm. Professor von Nussbaum commends the treatment, therefore, in his preliminary notice of it, for trial by those who have such cases under their care. It is extremely simple and has this very strong recommendation in its favour, that in place of a patient being forbidden to write, he is encouraged to write with the instrument as

much as he possibly can, in order thereby to strengthen the antagonists of the muscles liable to the spasmodic contraction. Whilst this ingenious invention of Professor Nussbaum is being employed, and the writer knows from personal experience that the art of using it is very quickly acquired, the sufferer from writer's cramp should be instructed to educate his left hand. When the surface of the skin is cold and white, counter-irritation is sometimes of considerable service. Hot mustard baths or the inunction of oil of mustard may be tried. Temporary agreeable reddening of the surface may be induced conveniently by the employment of Coirre's Revulsive Capsicin Pencil. This is supplied by Messrs. Mertens of 64 Holborn Viaduct; it is known by the name of "Gyrol." The pencil is passed lightly over the surface twice a day. Should the surface be red and especially if the patient be gouty, then a more vigorous treatment may be adopted with success. The skin may be cross-hatched with the point of a thermo-cautery twice a week.

So much for the spasmodic form of writer's disease.

SCRIVENER'S PALSY.—The treatment of the paralytic form of this neurosis, or true scrivener's palsy, does not vary materially from that of the spasmodic variety. The combined current, that is to say Faradism with galvanism, will be found useful; also, a Liedbeck's vibrator is a valuable adjunct. The vibration should at first be very slow and very gentle.

Dr. George Herschell and Mr. H. Geere Howard, the well-known electrician of 10 Berners Street, W., have devised an ingenious arrangement by which Liedbeck's vibrator may be worked by the ordinary street current.

§ XIV.

THE PULSE.

When an Oriental does suffer the European physician to touch the wrist of the jealously secluded wife or odalisque, the idea is of course that he may feel the pulse.

There is plenty of information on this subject to be obtained in the ordinary text-books; more especially in the excellent manual by Broadbent, entitled "The Pulse," [Cassell, 1890]; by Sansom, "Heart and the Thoracic Aorta," [Griffin, 1892]; by Ewart, "Pulse Sensations," being Section I. of "Heart Studies," [Bailliére & Tindall, 1894]; by George Oliver, "Pulse Gauging," [Lewis, 1895]; and in the various writings of Foxwell named in the Bibliography at the end of this work. But there is one fact about the pulse, of the greatest possible practical importance, of which the student will find no notice in any manual. It is closely connected with the true nature of so-called "fulness," an important factor in all pelvic and abdominal prognosis, but more especially when the subject concerned is of gouty tendency.

The important discovery of the true nature of "fulness" came about in the following way. The writer had had made, in the year 1896, a series of very careful admeasurements of his radial artery under varying conditions of blood-pressure. The effect on the sphygmogram was taken by means of Dudgeon's instrument:—

1. During expiration;
2. After forced expiration, the lungs being fixed;
3. During inspiration;
4. After long inspiration, the air being retained during 10, 20 and 30 seconds respectively;
5. Thirty seconds after resuming ordinary breathing.
6. Sixty seconds after resuming ordinary breathing. The two last were taken to shew if any rebound followed an unusually deep inspiration,

It was found that the sphygmogram shewed an apparent rise of arterial pressure, represented by 3 millimeters in the ascending systolic wave. A single glance at the last two apices of Fig. 30, will show this at a glance.

*Tracings taken to show that Expiration APPARENTLY dilates
the arteries.*

OBSERVATION 1.—Made on a gouty man aged 54, showing the normal pulse at radius at 3 p.m. (See Fig. 19.)

OBSERVATION 2.—(Fig. 20.)—Made on the same man, showing the pulse after forced expiration, the lung being kept void of air. The irregularity of the systole may be noted here, showing a difference of no less than 3 m. between the highest and the lowest of the peaks which represent the systolic ictus.

Again, the radial artery having been carefully calibrated by George Oliver, under ordinary conditions, by means of his extremely delicate and ingenious arteriometer, repeated experiments were made as to the effect of exceptionally complete expiration. The very interesting result was that a mean diametric increase of .25 of a millimeter was recorded. This added amplitude persisted during five minutes. Had there been no underlying fallacy, it would certainly be a very considerable enlargement to take place in the case of a man of middle age, in an artery whose internal diameter, under ordinary circumstances was only two millimeters!

Now it is a fact well known to physiologists that the arteries shrink during expiration. How are we to reconcile these discrepancies between careful clinical observations and the established experience of the laboratory? If these disagree, we do well to distrust the clinical evidence, good as it may be; and that it was good in this instance is guaranteed by the fact



FIG. 19.



FIG. 20.

1940-1941

1941-1942

1942-1943

1943-1944

1944-1945

1945-1946

1946-1947

1947-1948



FIG. 19.

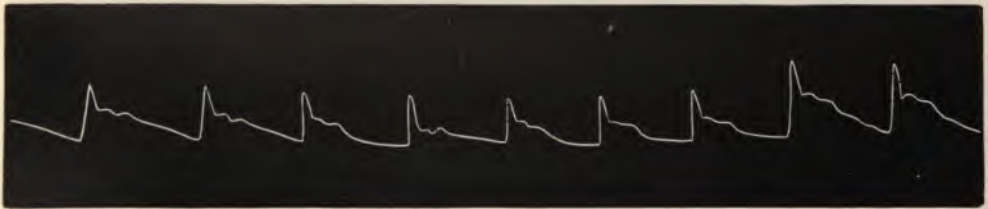


FIG. 20.

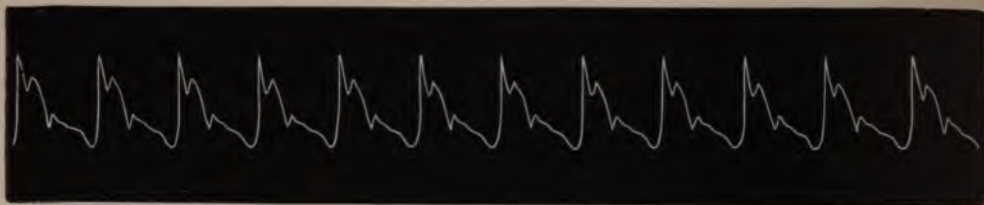


FIG. 21.
NORMAL PULSE-TRACING IN A HEALTHY MAN OF 76 DURING DIGESTION.

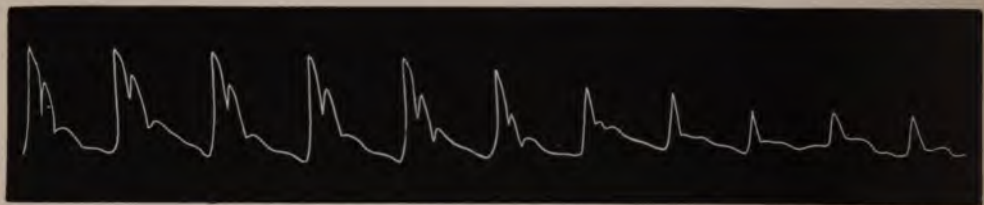


FIG. 22.
PULSE-TRACING TAKEN DURING RETENTION OF AIR, AFTER PROLONGED
INSPIRATION, IN A HEALTHY MAN, AGED 76.

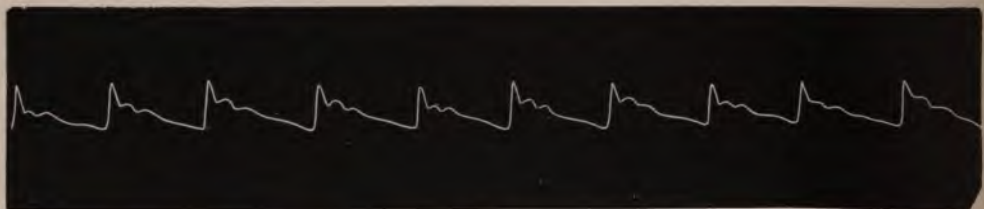


FIG. 23.
TRACING OF NORMAL PULSE AT RADIUS AT 3 P.M. IN A MAN AGED 54.

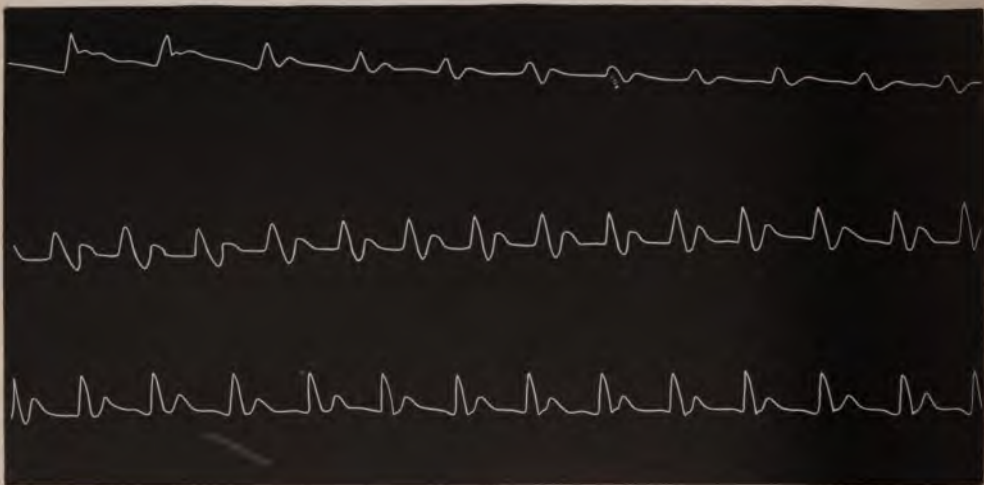


FIG. 24.
PULSE-TRACING OF SAME MAN, AGED 54, AFTER FORCED INSPIRATION
WITH RETENTION OF AIR.

that Dudgeon himself took the sphygmographic tracings, whilst the arteriometric readings were made by George Oliver, both of them being admitted experts of ripe experience.

It is more correct to say that inspiration contracts the arteries, than that expiration dilates them; but even in the observations made to ascertain the truth of the former position, there is one element of fallacy as to the after effects, which will presently be demonstrated.

The influence of respiration on the heart's action is graphically shown in the sphygmograms, which face this page.

OBSERVATION 3.—A healthy old man, aged 76, a vigorous golfer, was first selected. A normal sphygmogram was taken in a sitting posture, about one hour after luncheon. (See Fig. 21.)

OBSERVATION 4.—He was then directed to blow out forcibly, to take a long, slow inspiration and to hold his breath, with the result seen in Fig. 22.

OBSERVATION 5.—The lowest of the tracings on Fig. 24, shows the ten seconds that succeed a prolonged inspiration; the centre is the succeeding period of ten seconds; the upper reading indicates the time from twenty to thirty seconds of retention. The marked dirotism of the middle reading is interesting; it was predicted by Mr. Leonard Hill. We may observe the remarkable fall of the systolic peak from 5 mm. to 1.5 mm., at which time the radial impulse cannot be detected at the wrist by the finger-tips. It may be noted that the ventricle of the man of 54, responds at once; whilst the older ventricle, belonging to the golfer of 76, requires an interval equal to five beats in order to respond to the influence of air retention.

At this point a very important question arises. Is the artificial slackening of the ventricle followed by exaggerated action?

If it were sought to use this method of slackening the heart, for clinical purposes, it would very naturally occur to one to ask whether the dropping of the ventricular vigour is at all prone to be followed by a reaction of excess. If so, we might, by this manœuvre, unwittingly do more harm than good.

Led by many analogies, we might readily be excused, were we to infer that over-action would follow retarded action. For example. It has been shown by Dudgeon, and confirmed by Broadbent, that, after the apparently lost systolic impulse of intermittency, there comes an exceptionally powerful ventricular contraction. After tachycardia, too, there commonly follows bradycardia, and again abnormally low temperatures are well known to succeed unusually high ones. One would, therefore, naturally expect such a sequence to a slackened heart; but that capricious jade—Nature—never elects to fall in with our preconceived notions! The tracings shown in the plates, sufficiently demonstrate that, at least during health, there is no rebound; on the contrary, the heart simply returns to its normal state.

OBSERVATION 6.—(Fig. 25).—Normal pulse at radius after breakfast, in the same man, aged 54; tendency to gout, otherwise in robust health.

OBSERVATION 7.—(Fig. 26).—Same man whilst retaining air after long inspiration. The well-marked dicrotism may be noted in this reading.

OBSERVATION 8.—(Fig. 27).—Same man, thirty seconds after resuming ordinary breathing.



FIG. 25.



FIG. 26.



FIG. 27.



FIG. 28.

Section 1-
General

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at 100
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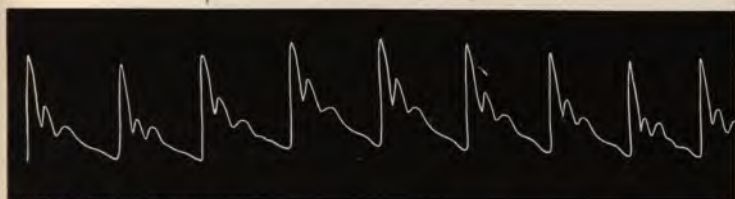


FIG. 25.

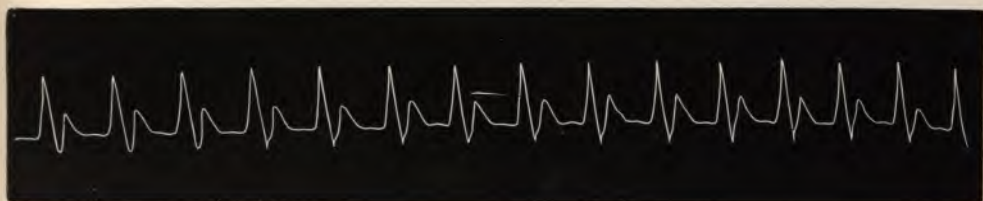


FIG. 26.

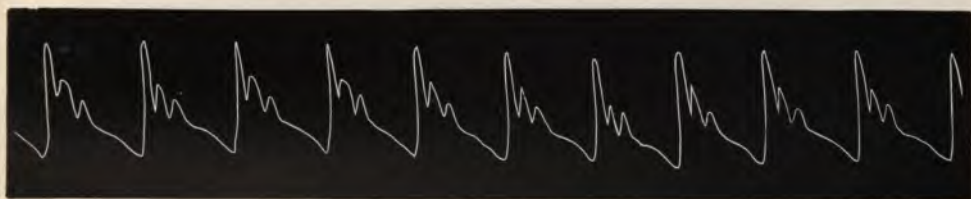


FIG. 27.

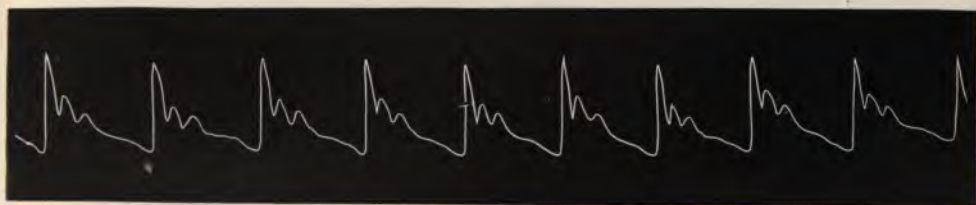


FIG. 28.

OBSERVATION 9.—On referring to Observation 9 (Fig. 28) it will be seen that the systolic contractions are more regular, less vigorous and less frequent than in Observation 6. This, of course, only shows that there is no reaction during health, but it may yet be proved that there is a peril of undue rebound in certain diseased conditions.

2. *Inspiration contracts the Arteries.*

In the gouty man of 54, the effect of profound inspiration on the peripheral arterial system was tried.

OBSERVATION 10.—The man sat down, and having quickly breathed out, he took a very slow and deep inspiration. The air was then retained, whilst no effort, either to inspire or to expire, was made. The internal diameter of the right radial artery fell from 2 mm. to 1·8. Four consecutive observations, made at intervals of two minutes each, gave the following table of results:—

Normal calibration	...	...	...	2 mm.
After long inspiration	...	...	...	1·8 mm.
In two minutes	...	...	...	2·1 mm.
In two minutes more	...	...	...	2·1 mm.
In two minutes more	...	...	...	2·1 mm.

This certainly looks like a rebound, but many more observations would be needed to eliminate the great number of sources of fallacy, more especially the venous turgescence. Meanwhile it is a very suggestive series of observations. At once it occurs to one that a sharp, short expiratory effort, followed by a long, slow inspiration with breath retention, when practised systematically, ought to help in the management of arterial over-dilatation, such as we find in neurasthenia, in exhaustion and during convalescence from the continued fevers.

These observations were subsequently repeated on the same man, whilst fasting, with substantially similar results. A few days afterwards they were obtained two hours after a very light meal, and then the variations were not so pronounced.

It may be remembered that persistent tonic contraction of the arteries means that a large proportion of the general blood-mass must be in the abdominal veins, forming the so-called "abdominal pool." Thence, unless pressure be applied to the belly or the body be inverted, it takes some time to emerge.

Should it be found, after a searching scrutiny and a critical sifting of evidence, with more extended research, by men of more leisure than the writer, men trained in the use of modern instruments of precision, that we can control the left ventricle at will, it at once becomes plain to the practical physician, that we have at hand a most valuable agent. It may be expected to come into play in the treatment of the various so-called "functional" affections of the heart, connected with over-action; in the tachycardia of Graves' disease and in the palpitation of the two chief climacteric periods. It should prove useful, too, in acute hypertrophy, particularly when associated with aneurysm, as well as in the various forms of deep-seated hæmorrhage.

PART I OF THE DYNAMICS OF RESPIRATION.

The Influence exerted by the Lungs over the Heart as to Rapidity of Action.

The following observations show the effects of forced expiration and of prolonged inspiration, on the frequency of the pulse.

OBSERVATION 11.—Tall man, aged 32, was fasting after a ten-mile walk. Is an abstainer; he uses tobacco moderately. All these experiments were made in the sitting posture. All were radial pulses.

(a.) Whilst breathing easily and naturally, pulse...	80
(b.) Whilst holding breath, after forced expiration	72
(c.) Whilst holding breath, after prolonged inspira- tion 	64

OBSERVATION 12.—Short and very slight man, aged 34, is a tea-taster by profession. He neither drinks alcohol, nor smokes; is in robust health; is fasting at 4 p.m. after a ten-mile walk.

(a.) Ordinary radial pulse 	68
(b.) Holding breath after expiration 	68
(c.) Holding breath after inspiration 	56

OBSERVATION 13.—A man of medium height and well nourished, aged 54, of rather gouty tendency, having slight pulmonary vesicular emphysema; is otherwise in vigorous health.

(a.) Radial pulse at midday whilst sitting... ...	65
(b.) Holding breath after expiration 	76
(c.) Holding breath after inspiration 	64

On directing this person to lie down, the relations of the three pulses were quite different. They became, respectively, 64, 64, 76; on standing up they were 72, 68, and in thirty seconds after retention of air, the pulse became so thready that it could not be counted.

OBSERVATION 14.—In the same man, the three pulses taken whilst the subject was fasting after a ten-mile walk, were 72, 72, 72.

OBSERVATION 15.—A woman of 50, the subject of chronic albuminuria, gave at midday fasting, the following figures, 66, 78, 60.

OBSERVATIONS 16 to 20.—Dr. C.—Pale, tall, spare man, aged 37, prone to intermittent action of the heart.

(a.) Ordinary pulse ...	...	...	53, 52, 50, 52, 53.
(b.) After expiration ...	...	...	58, 54, 56, 58, 58.
(c.) After inspiration ...	...	...	52, 48, 51, 52, 51.

Here a distinct acceleration will be observed after expiration, whilst after inspiration the heart is slowed down, but not to the same extent.

That such changes might take place was well known as far back as in the time of Rollett.* Physiologists have long recognized that the dilatation of the radial during and after expiration, is opposed to all the experience of the laboratory. To Leonard Erskine Hill, James Harry Sequeira and Harold Leslie Barnard belongs the credit of explaining the apparent discrepancy between clinical observation and the various experiments which have been from time to time made by physiologists on animals. They have recently worked the matter out most fully and exhaustively in the laboratory attached to the London Hospital.

As the result of a most important series of inquiries very carefully made by these observers, a complete solution of the problem is now supplied. In order that we may fully understand the value of the work of these gentlemen, it is needful to recall the precise anatomical relations of the radial artery at the wrist.

It is proposed to call the canal which is occupied by the carpal portion of the radial artery, the *radial sulcus*; it contains three vessels, namely two venæ comites and the radial

* Rollet, "Hermann's Handbuch," IV., pp. 292-299.

artery itself. The arrangement of the *venæ comites* with regard to the artery is peculiar; one of the veins is placed on either side of the artery, whilst a connecting branch is often found on its exposed surface; that is to say, it is anatomically anterior to the artery.

These anatomical relations are well seen in the following four figures, for the use of which I am indebted to the courtesy of the authors of the paper from which I am quoting, and of the proprietors of the "Journal of Physiology," published at the Cambridge University Press.

We can see that the radial is one of the worst possible arteries for testing the changes induced by disease in the vascular system. It is not only obscured by its investment of deep fascia, but it is absolutely surrounded by veins. A *vena comes* is found on either side, whilst a superficial vein often lies either directly over, or else in close proximity to the arterial line.

Radial artery
and
venæ comites

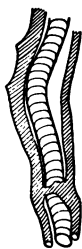


FIG. 29.

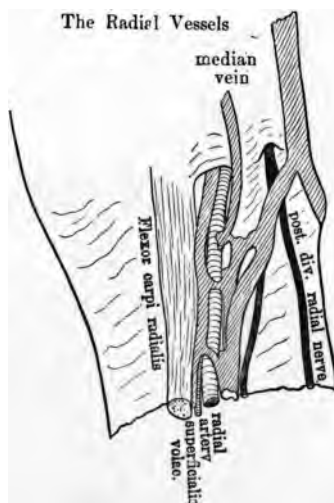


FIG. 30.

On dissection of the radial artery and its veins, in several bodies a general agreement with the arrangement shown in Figs. 29 and 30 was found to exist.

The figures are drawn to scale, from anatomical preparations placed in the museum of the Royal College of Surgeons, England. In Fig. 29 it will be seen that the radial artery is accompanied by two *venæ comites*, one on either side. One of these veins equals the artery in size, while the other is smaller. Cross veins of variable distribution pass in front or behind the artery, and connect the *venæ comites*. It will be seen in Fig. 30, that in addition to these, a branch of the median vein (rarely the radial), forms a connection with the *venæ comites*. Very commonly this vein lies over the artery for one or two inches. It is frequently larger than the artery, and it may, when distended, be easily seen beneath the skin.

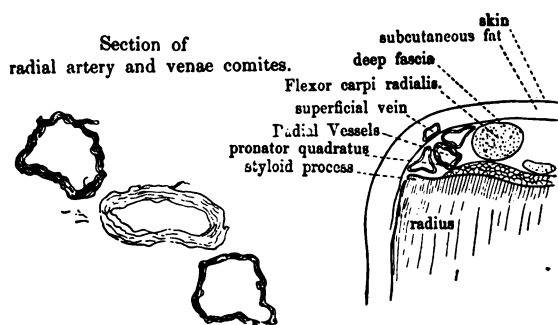


FIG. 31

FIG. 32.

In Fig. 32 is represented the arrangement of the veins and the artery drawn to scale, from a section of the fore-arm. The plane of the section passed through the spot where the radial pulse is usually explored by the finger or the sphygmograph. The artery and the veins which accompany it, lie in a space—the radial sulcus—between the styloid process of the radius and the tendon of the radial flexor of the wrist.

In Fig. 31 the radial artery and its venæ comites are shown in section. Here either of the venæ comites is almost equal in calibre to the artery. When fully distended they would, if taken together, be much larger. In the case from which Fig. 31 is taken, a ligature was tied tightly around the upper fore-arm, in order to prevent any escape of fluid. Then by means of pressure-bottles, the radial artery was distended from above, whilst the venæ comites were filled from below. When the vessels were distended, nay even after they were laid bare by the division of the skin, they felt to the finger like one broad flat band filling the *radial sulcus*. The artery was then rhythmically pulsed by compressing the tube connected with the arterial pressure-bottle. It was impossible to distinguish with the finger that the central part of the band above pulsed, for both veins and arteries seemed to share in this movement.

The arteriometer gave a greater reading when the veins and the artery were distended, than that which was recorded when the artery alone was filled.

It was thus proved that both the breadth of the pulse and the apparent diameter of the radial artery, are increased by distension of the venæ comites. Much more would this be the case, were a large superficial vein to lie over the radial artery.

So much for the anatomical evidence, and now for the experimental proofs.

It is of interest to note that any instrument, used in recording the characters of the radial pulse, may be misleading, under certain exceptional conditions of exaggerated venous pressure, in direct relation to its delicacy. A sphygmograph would deceive the observer more than a rough and ready manometer, like that of Rayner Batten, and an exceedingly delicate arteriometer, more than the sphygmograph.

EXPERIMENTAL EVIDENCE.—The radial pulse in man was investigated under varying conditions of venous pressure with the help of the Dudgeon sphygmograph, the arteriometer and the finger. So far as regards observation with the finger, the literature of the pulse abounds in so many loose terms, that it is proposed to define those now employed and to make them at once as simple and complete as possible.

On examining the radial sulcus, *i.e.* the space which lies between the styloid process of the radius and the tendon of the flexor carpi radialis, the following expressions may be used without grave inaccuracies.

1. The size or breadth of the band-like swelling, composed of the artery and the veins, which more or less occupy this space.

2. The tension of the band. By this is understood the sense of pressure necessary to obliterate the calibre of the artery and stop the pulse.

3. The condition of the arterial wall, investigated in the usual way by flattening the radial artery with the tip of the finger and rolling it upon the bone.

4. The oscillation more correctly called "the pulse." This admits of description in the following particulars:—(*a*) frequency, (*b*) regularity, (*c*) amplitude of excursion, (*d*) period of excursion, (*e*) diastole.

It appears that all important information obtainable by the finger as to these vessels, may be classified under these heads.

In the following experiments, the sphygmograph was arranged and the weight was adjusted, so as to give the maximal excursion of the lever obtainable in each case.

In order to verify the results obtained from man, experiments were carried out on the femoral pulse of the dog. Both vagi were divided in the dog, whilst under chloroform anæsthesia. Then the femoral artery and vein

The first of these is the fact that the
 number of people who are
 employed in the
 service sector has
 increased in the
 last few years.
 This is due to the
 fact that the
 service sector
 has become
 more important
 in the economy.
 The second
 reason is that
 the number of
 people who are
 employed in the
 manufacturing
 sector has
 decreased in the
 last few years.
 This is due to the
 fact that the
 manufacturing
 sector has
 become less
 important in the
 economy.

As a new way of thinking about the environment, the concept of sustainable development has been widely discussed and debated. It is with regard to this concept that the following points are made:

were dissected out, and beneath these vessels was inserted a small piece of wood. The sphygmograph was then applied to the vessels, and records were obtained during a constant condition of morphia-narcosis. To limit the collateral circulation, a ligature was drawn firmly round the thigh, omitting the femoral artery and vein.

The following records of the experiments, will demonstrate that the breadth of the band-like swelling, formed by the vessels in the radial sulcus, the elevation of the base-line of the sphygmographic curves, the amplitude and dicrotism of the pulse, depend largely on the general venous pressure.

EXPERIMENT 1.—Compression of the veins of the arm, without occlusion of the brachial artery. Tracing 1.

As the veins fill, the line of the sphygmographic curve shows a gradual rise. This rise is considerable, but the excursions of the percussion or primary pulse-wave and of the dicrotic wave, are diminished. On withdrawing the compression, the veins void themselves and the pulse-tracing slowly returns to its normal condition. To the finger, the breadth or fulness of the vessels in the radial sulcus, appeared to be greater during the compression of the veins, whilst the amplitude of the excursion seemed to be diminished. The arteriometer gave an increased reading. In one experiment, the diameter appeared to be enlarged by as much as $\frac{1}{6}$ to 1 mm.

EXPERIMENT 2.—Compression of the veins of the arm followed by compression of the brachial artery. Tracing 2. In this tracing, an arrow marks the height which the base line of the curve reached before the veins were compressed. The point to be noticed is that on compressing the artery, the line of the sphygmogram does not fall, because the venous outlets are entirely blocked. It will be seen that as the engorged veins are allowed to empty, the line of the curve gradually falls.

EXPERIMENT 3.—Gradual compression of the femoral vein of a dog, with a record of the pulse taken, while the pad of the sphygmograph rested upon both the femoral artery and vein.

Tracing 3. It will be seen that this tracing bears a close resemblance to tracing 1. As the vein was compressed, it could be felt and seen to gradually distend, until in diameter it more than equalled the artery. When entirely occluded, its tension as estimated by the finger or by a manometer, was practically the same as that of the artery. The arteriometer gave a reading of 2.5 mm. when the vein was open, and 3.2 mm. when it was occluded. It should be remembered that such an extreme condition as this would never be encountered in disease.

EXPERIMENT 4.—Compression of the femoral vein, with the pad of the sphygmograph resting on the femoral artery only.

Tracing 4. There occurs here, on compression of the vein, no perceptible rise in the line of the curve.

Manometric readings showed that the pressure in the femoral artery does not rise when the veins of the thigh are totally occluded. The pressure rises, however, in these veins to the static arterial pressure. The tension is not increased in the artery beyond the aortic pressure, for the blood takes the pathway of least resistance through other channels, and thus the increase of peripheral resistance, produced by blocking the vessels of the thigh, is not sufficient to raise the mean aortic pressure.

EXPERIMENT 5.—Occlusion of the femoral vein, with the pad of the sphygmograph resting on the vein only.

Tracing 5. By this record it is shown that the rise of venous pressure can produce a very marked elevation of the lever of the sphygmograph.

CONCLUSIONS.—As soon as the fact is once grasped that the veins which surround the radial artery bear an important share in the production of the phenomena of the pulse, almost all those difficulties, which have hitherto surrounded the explanation of sphygmographic tracings, disappear. In place of these an absolute agreement, between the results obtained on animals and those on man, becomes apparent. The variations of blood-pressure produced by experimental changes in the working of the respiratory pump, have been found to be the same, whether recorded by manometers inserted into the veins and arteries of animals, or registered by the sphygmograph applied to the radial pulse of man.

A rise of intra-thoracic pressure raises venous pressure and lowers arterial tension. The combined effect of these variations leads to the elevation of the line of the sphygmographic curve. This must be so, for the venous outlets of the arm are blocked, and the pressure rises in the veins, which accompany the radial artery, until these vessels are distended above the level of the artery, when the pad of the sphygmograph is elevated.

Similarly in all the pathological conditions of obstruction of the circulation, arising from pulmonary or cardiac disease, wherein by back pressure, the general venous tension is raised, and the arterial pressure lowered, the veins which surround the radial artery must have an important share in giving to the pulse the quality of breadth or "fulness" which is so commonly combined with that of low tension. The finger cannot distinguish the pulse transmitted to it by the *venæ comites*, from the oscillation of the artery itself. Thus it seems that the palpation of the breadth, or fullness of the vessels, which more or less fill the radial sulcus, combined with the estimation of tension, becomes a valuable clinical guide to the condition of the venous and arterial sides of the circulatory system. When the quality of fullness

is estimated to be present between the pulse-beats, this does not betoken a high arterial tension as is commonly stated, but rather an engorgement of the venous system.

These observers make a point of the fact that the veins when distended can completely fill the radial furrow. If the breath be held after expiration, as in Müller's experiment, the veins become extremely turgid, and then even if the artery be diminished in calibre, the illusory sensation of enlargement is conveyed to the finger of the observer. Thus arteriometric observations made at the wrist may readily be vitiated. Sphygmographic readings, taken in this locality are gravely invalidated. It is certainly possible that manometric records may not be so much affected. At first sight, these observations of Hill, Sequeira and Barnard may not seem of very great moment; a little thought will, however, make it clear that pulse-readings, especially in conditions associated with venous turgescence, are not of much value, unless they be taken on a superficial artery, such as the anterior temporal, not usually accompanied by a vena comes.

These really important observations, of which an outline is given here, will be found *in extenso* in the issue of the "Journal of Physiology" of March 17, 1897, Vol. 21, p. 147.

Though we now know that the arteries do not dilate under the influence of expiration, yet I may say that I have seen the greatest benefit accrue from forced expiration followed by profound inspiration, in cases of mitral insufficiency, combined with a contracted condition of the arterioles. For example, a lady of 64 years of age, with marked cyanosis, and with dyspnoea on the slightest exertion, lost both these symptoms entirely in ten days, by practising forced expiration, followed by prolonged intake. She has remained free from these distressing symptoms for eight years. This case suggests that temporary contraction is followed by persistent dilatation; as we see, indeed, in the instances of hot air—and hot water-baths.

PART II OF

THE DYNAMICS OF RESPIRATION.

*The influence exerted by the Lungs over the Heart as regards
Vigour of Action.*

I propose now to show an indirect method of influencing the heart for good, by modifying the respiratory acts. I will first describe the plan for quieting an irritable and overworked heart, such as we get in cases of tachycardia and in the functional palpitations.

It has long been known that certain persons possess the power of slowing down the heart until apparently it ceases to beat. For the most part this fact has either been shrouded in the garb of mystery, or it has been looked upon as a sort of juggler's trick. No entirely satisfactory scientific explanation of this curious phenomenon has been laid before the profession. This feat of arresting the heart's action has been usually explained by attributing it to vagal pressure in the neck. But when we speak of applying anything to the pneumogastric in the neck, we should bear in mind that it is impossible to apply pressure to the vagus, without at the same time compressing the sympathetic and also modifying the passage of the blood to and from the brain.

Gaskell says that excito-motor fibres have never been demonstrated to exist in the vagus of man.

Allowing for the sake of argument that there may be a pneumogastric motor fasciculus, still there would even then be a great many more inhibitory, than excito-motor fibres in the vagi; therefore, pressure upon them ought to stimulate the heart, unless applied so suddenly as to introduce the element of shock. Unusual conditions may make it possible to press the pneumogastric nerve alone.

It has been stated that Dr. Weir Mitchell can modify the action of his heart, by pressing his vagus against a bony nodule, conveniently placed on one of the cervical vertebræ.

It may be doubted whether the jugglers of India are sufficiently good anatomists to find and to compress the vagus alone. I must confess that it seems to me even more likely that they alter the action of the heart by modifying the natural movements of the lungs. It is no secret that certain malingerers will abolish the radial pulse by merely dropping the shoulder. There is a plan by which, without the use either of drugs or of any special mechanism, the vigour of the ventricles may be slackened down to such an extent that the action of the heart seems to be entirely arrested. The best way to perform this extremely simple feat, is to select a healthy and mature male and to let him assume a standing posture. The observer lays a finger on any convenient artery, having a superficial distribution. The subject of the experiment is directed to expire forcibly, and then to hold the breath. He is then requested to take a long, slow and deep inspiration, and at its completion to hold the breath again. It is now especially enjoined on him to remain passive and not to make any effort at expiration or inspiration. At this point the ventricles begin to slacken, and in some persons the impulse of the artery can scarcely be detected after the lapse of a few seconds. (See Fig. 24, opposite p. 65).

It may be noted that the first temporary effect of retention of air, preceded by prolonged inspiration, in a healthy man, during middle life, is to diminish the vigour of the ventricular systole and to quicken the heart's action.

A reference to Observations 5 to 9, etc., pages 65 to 67, will serve to show this very distinctly. In the man aged 54, the pulse, after mental fatigue, stood at 60 beats per minute. After a forced expiratory effort it fell as low as 54 beats. Subsequently to a deep inspiration, it ran up, in

the space of ten seconds, to 84. At this point it remained for twenty seconds, becoming markedly dirotic; it afterwards fell to 66. At this stage, forced breathing had the effect of bringing up an abnormally slow pulse to a point near its normal healthy average, namely, 72 beats per minute.

Even more marked is the effect of forced respiration on the same man, refreshed and at rest, in the morning. (See Observations 6, 7, 8 and 9, Figs. 25—28, opposite p. 66.)

Before experimentation, the pulse stood at 72, the average pulse of a healthy male adult. Inspiration raised it to 90. It then fell, in the course of 30 seconds, to 60 beats per minute—12 below the original point.

It is interesting to note that in the older subject, the man of 76, the effort of inspiration, followed by retention, served to drop the pulse at once to the extent of six beats per minute. (Observations 3 and 4, Figs. 21 and 22, opposite p. 65.)

A word of warning may here be given to experimenters. The holding of the breath, after prolonged inspiration, is not a perfectly harmless amusement under all circumstances. In health and in the recumbent posture, it is safe enough, but in the case of a damaged or unnourished heart, the manœuvre should be carried out with strict attention to certain precautions.

Should the total quantity of the blood mass be limited, the arteries contracted, and the heart dilated, more especially if the mitral valves be incompetent or the aortic orifice damaged, then the effect of expiration is to empty the lungs of blood, to still farther shrink the general arterial calibre, and to squeeze out the heart. The blood tends to collect in the belly. Now, a profound inspiration causes the lungs to swallow up all the available blood; it also draws asunder the flaccid cardiac walls and prevents, too, the voiding of the larger veins, with the result that nearly all the blood contained in the body is to be found in the abdominal and

the pelvic veins. It may be remembered that in a somewhat similar manner, terror proves fatal to man and to the so-called "lower" animals alike. In his remarkable essay on "Fear," Mosso has shown that under the influence of sudden alarm, we instinctively "gasp"; that is to say, we take a deep inspiration, and then we hold the breath, fixing the diaphragm. The arteries contract as is shown by the deadly pallor of fright. The blood is steadily emptied into the venous system. The splanchnics are paralyzed, and the whole mass of blood, collecting in the abdominal veins, the noble organs being robbed of supply, fatal syncope is the result. Hence, men and the other animals which walk erect, are more prone to be demoralized by terror, other things being equal, than those which ordinarily assume the horizontal posture. Death, from being crushed in a crowd, comes in a similar way. For this reason women and children are the first to perish. Not so much because they are more feeble, but because with them terror plays a more prominent part. Added to this, they depend more on chest-breathing, hence they suffer more from thoracic compression. There is a similar mechanism in chloroform syncope. The cure for which, as has been said above, is to press the belly and the chest alternately at steady rhythmic intervals.

THE ABDOMINAL POOL, AND HOW TO VOID IT.

It is now generally recognized that a condition of the body may exist, in which the bulk of the blood is to be found in the deep abdominal veins, the rest of the system being in a state of anæmia more or less profound. The mass of blood, lying under such circumstances in the abdominal veins, is conveniently called "the Abdominal Pool."

It has been shown by Leonard Hill that this is the state of things during death by chloroform. This splanchnic

paresis is encountered under widely differing pathological states, but common to all of them is a depleted condition of the smaller arteries. Such a state of things may be met with in cases of severe vaso-motor ataxia; in chlorosis, constipation, pregnancy, lead-poisoning; in albuminuria of certain kinds; in early atheroma; in syphilis and myxœdema; in Savill's idiopathic arterial hypermyotrophy; in frost-bite, Raynaud's disease, and in the chilblain family generally; in emphysematous subjects, with gouty high tension and also in indolent and overfed persons, who are prone to general supervenosity.

If to a contracted condition of the arterioles, we add a dilated state of the veins, more especially of those veins which lie under the influence of the splanchnic nerves, we reach an attitude of affairs in which syncope is always within measurable distance. A state of things may then exist in the human body, in which a man may die with all his tissues completely exsanguinous—the death of acute hæmorrhage—without losing a single drop of blood from his body!

Nélaton's manœuvre of inverting the patient for the cure of chloroform syncope, has been wrongly explained as a tipping of the blood from the body into the brain. This is a fascinatingly simple solution, but it is evidently erroneous, for there is no blood, either in the heart or in the arteries, to be "tipped." The real explanation is that the blood is tilted out of the abdominal veins into the right heart, whilst the supervenosity of the intracranial respiratory centres stimulates the diaphragm to contract and the ribs to ascend. For the same object can be gained by sharp general abdominal compression.

Firm general pressure on the belly, rhythmically alternated, not too rapidly, with compression of the thoracic cage, is a far more scientific procedure for the prompt cure of chloroform-syncope than any of the ordinary methods of stimulating the bulb, producing vaso-motor paresis with

amyl nitrite or inverting the patient. The last method might quite conceivably paralyse the enfeebled right heart by a sudden overwhelming volume of blood. Thus we see that Nélaton, as so often happens, was right in his facts, but wrong in his explanation of them.

The state of things involved in the existence of the Abdominal Pool, lends an element of needless peril to surgical narcosis.

Professor Leonard Hill, in his latest utterance, Hunterian Lecture, R.C.S., February 8th, 1899, states that the act of hanging a patient legs-up, is a proceeding not entirely unfraught with peril. There is a considerable danger of flooding the right heart with blood, so that its very limited powers of contraction would be paralysed. Add to this that the blood is of no use in the right auricle. As it passes into the left ventricle in an ordinary way, by suction of the dilating ventricle, aided by gravity, the contractile power of the auricles being a negligible quantity, the blood would tend to remain in the right auricle, where it is of as little use, as in the abdominal veins. Hill says that it is better, if chloroform-syncope occur early in an operative procedure, that is to say, in the struggle-stage, promptly to lay the patient flat and then to firmly press the whole belly, to evacuate the Abdominal Pool. Then do artificial respiration to aspire to the thorax. Then again compress the abdomen. Then artificial breathing. These processes to be repeated rhythmically till consciousness return.

Should chloroform-syncope occur at a later stage, say after the operation, the belly should be firmly pressed in the supine position. Then the trunk should be raised in order to favour the passage of blood from auricles to ventricles and artificial breathing done. Then the patient may be again laid down, to favour venous return and then again respiration in sitting posture and so on.

When a well-fed patient of ripe years and indolent habits, having a pendulous belly, eczema, piles and general varicosis, comes to consult us, we may take it that a good deal of the blood that should be assisting in the nutrition of the body, is lying useless in the abdominal veins. The right heart is embarrassed. We can greatly aid matters at once by redistributing the blood. That the Nauheim baths act partly in this way is proved by Hill's famous experiment, devised to show the function of the pericardium in preventing over-distension of the heart.

He takes a healthy snake and lays bare the pericardium. He then hangs the snake in the vertical position, tail down. Slowly the blood-mass accumulates in the veins of the splanchnic area. The heart is drained and the reptile is virtually dead. Now the snake is slowly immersed in water and as the water rises, the heart fills and beats once more. Now the snake is inverted and the pericardium having been dissected away, the heart is seen to fill and expand nearly to bursting point. This is a very instructive experiment for other reasons. It tells us that the huge hearts, figured as found at Nauheim and elsewhere, are probably quite mythical, unless associated with pericarditis or its results.

Founded on these interesting and valuable researches, I have devised a plan for the immediate relief of pelvic and portal venous stasis, which I have been practising for the past four years and which I had the honour of introducing at Nauheim. Exercise and judicious dieting form, of course, the elements of a natural cure. But some patients *cannot* take exercise and many of the wealthy *will not* be dieted; such persons are much benefited by the following treatment:—the patient is first placed on the back, upon an inclined plane. The heels are raised, whilst the head is just as low as can be comfortably borne. The leg adductors are thrown into sharp contraction and kept tense. Then whilst the

patient makes a sustained effort at deep costal INSPIRATION the knees being kept in contact, the attendant slowly and firmly empties the femoral veins. An aspiration takes place during this manœuvre from the caval veins to the right auricle, whilst about four ounces of fresh blood are forced from the femoral veins into the external iliacs and thence, by the common iliacs, into the inferior vena cava. The attendant now places his palms on the thorax, his fingers outspread, and firm pressure is made on its larger anterior aspect. The right hand is applied over the cardiac region, the left over the liver. Now as the patient blows out, the hands of the attendant move down and compress the abdomen as firmly as possible; the abdominal wall being at the same time sharply retracted. A forced EXPIRATION is at the same time made in order that the flow of blood from the left heart may be favoured. By this means intrathoracic pulmonary pressure is increased. After giving time for rest, the same processes are repeated. Where venous stasis exists to a very pronounced extent, it is better to begin by voiding the abdominal veins.

In severe cases of sagging abdominal wall, with paresis of the recti, obliqui and transversales, a strong and well-fitting abdominal belt, attached to the drawers to prevent riding up, should be worn. In cases of pendulous belly, it is most important that the feeble muscles of the abdominal parietes should be well supported until the normal tone is restored by the various means at our disposal for this purpose.

Much may be done by the patient in educating the tone of the abdominal wall. The belly can be kept retracted by an effort of the will. A good exercise is to lie on the floor with the toes tucked under a chest of drawers and the arms folded à la Napoleon, and repeatedly rise to the sitting posture, slowly counting aloud to prevent undue strain on the abdominal rings. This manœuvre alone has

been found to cure chronic constipation. The Liedbeck Vibrator is of great service in restoring tone to the muscles of the abdominal wall and to the circular fibres of the colon. Gentle cycling has a most valuable effect in giving tone to the muscles of the abdomen, including the very important iliaco-psoæ.

LUNG DEVELOPMENT.

As to the practical method of developing the breathing powers in otherwise vigorous persons, as in athletes with cardiac hypertrophy, not associated either with dilatation or with any other organic change, we may direct that the manœuvres about to be described, be carried on whilst standing erect. The patient is requested to blow out quickly through a small opening produced by the pursing of the lips. At the same time, he bends the head and then the dorsal portion of the spine, whilst with his outspread fingers, he compresses the sides of the thorax. Having done this the fingers are enlaced behind the neck, the mouth is closed, and a very, very slow, prolonged inspiration is taken through the nostrils, whilst at the same time the spine is slowly extended. The object in placing the hands behind the neck is to bring into play all the muscles of extraordinary respiration, especially the cervical muscles and the pectorales. If the ventricles be thick-walled then the breath may be held as long as possible. The performance may be repeated every five minutes. Thus the greatest possible effect is obtained. It should only be practised in this way in the case of powerful and sthenic subjects.

In more delicate patients, these respiratory gymnastics may be practised in a sitting posture, with intervals of an hour or two between the séances. The air should be retained for five seconds only.

In still more feeble persons, the air should not be retained at all. The movements may be done after light meals or at bedtime.

Should the abdomen be very protuberant, the patient may be taught to retract it a little more each day. It may be kept drawn in for a longer period by degrees, until the retraction becomes habitual.

When the muscles are badly fed or are degenerate, then the breathings should be preceded by very gentle muscle-education, associated with systematic and suitable feeding. The combined current, applied through the hand of the attendant, associated with soft, slow massage, is of undeniable service. Should the lungs be unequally developed, then the movements may be conducted with the patient lying on the good lung.

We may remember, in connection with these procedures, that George Oliver found that *pétrissage* (deep kneading) contracts the arteries, whilst *tapotement* (patting) and *effleurage* (literally "grazing," but now used for superficial rolling) have the opposite effect of causing dilatation.

The practical lesson to be learned from this is that people with dilated arteries, as in convalescence from some acute disease—people with hot extremities, as in *acroparæsthesia*, should have deep rubbing.

Most gouty people and those with the chilblain diathesis, as in Raynaud's disease, should have light, superficial massage. For the sake of emphasis, I will repeat that, if the abdomen be lax and prominent, the patient should be educated to retract the belly-wall for a little longer time and a little more vigorously, every day.

I will now give two examples of the use of these methods, in removing abdominal and crural venous stases respectively.

CASE OF LARGE LIVER SHRUNK BY BREATHING.

GOUTY EMPHYSEMA, WITH HÆMOPTYSIS AND ENGORGED LIVER.

The Rev. G. R. T., aged 35, resides in South Devon. He has well-marked pulmonary vesicular emphysema of the hypertrophic type. Liver extends one inch below hypochondrium.

Radial artery on 9th May, 1895:—

Sitting, internal diameter	...	1·5 m.
Lying " "	...	1·7 m.
Pulse pressure, Sitting	...	130 grams.
" " Lying	...	100 grams.

After six forced expirations and full inspirations with rests, occupying half-an-hour, Dr. Oliver, who kindly saw this case with me, found that the numbers were as follows:—

Internal diameter of Radial	Sitting	...	1·9 m.
" " "	Lying	...	1·5 m.
Pulse pressure, Sitting	...	...	100 grams.
" " Lying	...	...	90 grams.

and his liver only extended half-an-inch below the edge of the lowest rib. So that the pulse-pressure had fallen as much as thirty grams, whilst his liver had contracted at the rate of one inch per hour! This contraction was maintained. It is to be noted that this remarkable diminution in the extent of hepatic dulness was observed by Dr. George Oliver, of Harrogate, and not by the writer. Dr. Oliver was not prejudiced in favour of this method, which was indeed a novelty to him. It is probable that we have here a method of promptly relieving acute congestion of the liver. There is certainly no drug known to man which will cure hepatic stasis in an hour!

CASE OF VARICOSE VEINS CURED BY VOIDING ABDOMINAL
POOL.

GOUTY EMPHYSEMA, GRANULAR THROAT, VARICOSE VEINS IN
LEG, ECZEMA ANI, PILES AND FISSURE.

The Hon. P. de V. is 35, a fine, tall, broad-shouldered man; naturally active and of even disposition, he has become irritable in temper and indolent in habits; he has dyspnœa on exertion. Had acute gout as a boy at Eton.

He was inverted for one hour daily and the Abdominal Pool was emptied. In ten days, his prominent abdomen had retracted, the piles and varicosis were gone and he could take violent exertion all day with enjoyment.

LIMITATIONS TO THE EMPLOYMENT OF THE DYNAMICS OF
RESPIRATION.

Such valuable agencies as these are quite certain to be abused, yet this fact must not be allowed to prevent their use, under certain safeguards. Dr. Ewart, of St. George's, admittedly an authority on cardiac subjects, writes to me thus on this matter:—"Of the potency of the agencies in question, there can be no doubt; the practical point is whether we should be afraid to manipulate them, or whether we may hope to turn them to account in pathological cases so as to gain advantage, without incurring any of the various risks which would undoubtedly attend their indiscriminate use. There is a fine field open for clinical observation, but, for my part, I should not like to invite any but the most competent and prudent observers to undertake so delicate and responsible a study."

I will admit that, at first, I was inclined to share this gentleman's scruples, but a little more thought and a more extended trial have served to convince me that such pro-

cedures, whilst holding out the highest hopes of giving prompt and permanent relief in cases of an admittedly intractable character, are scarcely fraught with more peril to patients than the lavish use of such lethal weapons as morphia, chloral, cocaine and prussic acid, now frequently employed in the daily routine of practice.

Should these other methods be employed, it is important that the indications for their use be noted. Their use is proposed chiefly in cases of over-compensation where hypertrophy is exaggerated—for the hypertrophy that accompanies pregnancy, as well as fibroid degeneration of the uterus, when it interferes with sleep and gives rise to distressing over-action of the heart—in the tachycardia of the climacterics, of Graves' disease, of tea-poisoning, of tobacco toxis and in that very similar condition which occurs in association with dilated stomach, arising probably from a vagal neuritis. In the various vasomotor ataxiæ it should be of enormous value.

There are one or two further words of caution which it is necessary to give with regard to this method of slacking the heart.

The first is that its routine use is deprecated in the following cases:—

1. Septic and other forms of toxic myocarditis.
2. Dilatation.
3. Fatty degeneration.
4. Fat-laden heart.
5. In anæmia of pernicious type.
6. In profound debility.
7. In valvular incompetence, especially in mitral insufficiency.

In such conditions the various manœuvres which have been described are not entirely contraindicated, but their employment should be cautious and tentative. They should

be carried out in the lying posture and for a very short time. The arms should on no account be raised above the head. These performances should not be done after general exercise nor after a full meal. With these precautions, they form a most valuable adjunct to the Nauheim methods.

OTHER METHODS OF MODIFYING THE ARTERIAL CALIBRE.

A very great variety of agents possess the power of changing the size of the arteries. To Dr. George Oliver, of Harrogate, belongs the credit of investigating these etiological factors in a scientific manner, and of determining their relative value as clinical agents, see chapter 2, "Pulse Gauging." [Lewis, 1895.]

For example. Dr. Oliver finds that the radial calibre is augmented by—

- External warmth,
- Exertion,
- Effleurage,
- Tapotement,
- Digestion whilst lying;

is diminished by—

- External cold,
- External heat,
- Pétrissage,
- Digestion if sitting,
- The dependent posture.

It is not generally recognised that whilst a hot bath shrinks the arteries just as a cold one does, a warm one dilates them, and a tepid immersion leaves them unchanged. Some would be surprised to learn that the radial artery may be doubled in size, that is to say, its diameter may be increased from 1·3 mm. to 2·6 mm. by raising the temperature of a bath 60 degrees, that is, from 40 degrees F. to 100 degrees F.

These notes were taken at the wrist, and they may be modified by other observations made on some artery, such as the anterior temporal, not usually accompanied by a vena comes. Making due allowance for all possible sources of fallacy, it becomes evident that the temperature of a bath should be decided on strict scientific principles, and not left to chance or to the decision of an ignorant attendant. It is equally true that the same kind of massage should not be ordered indiscriminately. For instance, gouty people, if they have contracted arteries, should have warm baths with tapotement and effleurage, whereas neurasthenics and convalescents from acute disease, should have pétrissage, or else cold baths.

In a state of health and as long as the tissues of the body retain the elasticity of youth, the calibre of the arteries is perpetually changing. The loss of this variability, before the epoch at which we should look for physiological, senile degeneration, should always excite suspicion. The possibilities of gout, of renal disease, of alcoholism, syphilis, saturnism, pregnancy, early atheroma or of myxœdema, should be kept in mind.

DILATED RIGHT HEART QUICKLY RELIEVED BY VOIDING THE ABDOMINAL POOL.

DILATED RIGHT HEART, ENLARGED LIVER, CONSTANT COUGH, PALLOR, CYANOSIS AND GENERAL ECZEMA.

Since writing the preceding pages, I have been consulted by a man, aged 64, from San Francisco. He came on account of incessant ineffectual cough.

History.—He has been ill off and on since 1860. Has been accused of mitral obstruction, no trace of which can be discovered. Had bulbar paralysis in 1880. His right soft palate is now parietic; tongue deviates to left;

speech somewhat thick. Prone to recurrent attacks of distended stomach and colon. He is markedly pallid; the lips are cyanosed; he pants on exertion. Pain in the back of his head. His cough is very troublesome, especially at night; scanty, pearl-like expectoration. Much dreaming. Influenza on 15th March; much worse since. Urine healthy, lungs normal, left heart normal—no bruit. I found that the right heart extended three inches from mid-sternum. Asked a cardiac specialist to examine him independently. He came to the same conclusion. He kindly examined again after I had voided the abdominal pool. The right heart had receded half-an-inch, and the cyanosed lips were then ruddy and the pallid face looked much more rosy.

A consideration of the appended cutting from "Treatment," of April 13, 1899, [Rebman Pub. Co.], makes it seem likely that the carefully regulated use of profound *inspiration, with retention*, may prove to be of value in assuaging the severe pain known as "biliary colic." The writer has seen this condition instantly relieved by the use of Greville's thermo-electric saddle-back. The heat (300° F.) caused a copious flow of bile, which evidently washed out the obstruction, having relaxed the spasm of the common bile-duct.

"Dr. P. J. Möbius, of Leipzig, who for the last seven years has been subject to attacks of Hepatalgia, probably due to biliary lithiasis, has succeeded in moderating the painful paroxysms by deep, slow inspiration. Each inspiratory movement lasts about five seconds, and the chest is then maintained in a condition of full expansion for from fifteen to thirty seconds. During this time the lower edge of the liver is depressed about five centimetres. Thanks to this 'inspiratory massage of the liver,' Dr. Möbius often succeeds in warding off slight attacks of hepatic colic, and in obtaining more or less relief during the progress of others."

APPENDIX.

ACHONDROPLASIA.—Since going to press, my attention has been called by Dr. Boyd Joll to a disease of defective nutrition in early childhood, characterised by a very peculiar forked hand. This was first observed by Dr. John Thomson, of the Edinburgh Children's Hospital.

Of this interesting condition I am enabled, through Dr. Thomson's courtesy, to show an illustration.



FIG. 38.

ACHONDROPLASIC HAND.

This curious disease appears to have been first described by Depaul in 1851. It received its present name from Parrot, who published a monograph on it in Paris in 1866. (See Bibliography.)

Symington and A. Thomson gave an account of it in 1892.

There is a full description of it by John Thomson, at page 298 of his well-known work on "The Clinical Examination and Treatment of Sick Children," published by Clay in 1898.

Achondroplasia is a foetal disease in which there is an absence, arrest or perversion of the normal process of endochondral ossification, of the most definite and universal character, in every element of the skeleton, in which the process takes place during intrauterine life.

The hands, although short and broad, with crumpled and apparently redundant skin, like those of cretins, differ distinctly in showing a further peculiarity. This consists in a sort of parting between the middle- and the ring-fingers; so that when the hand is laid on a flat surface, the index and medius curve towards the radial, whilst the ring- and the little-fingers turn towards the ulnar side.

This sign is pathognomonic, so that the disease is readily distinguished from cretinism and other forms of dwarfing, by the bird-like division of the hand into a bifurcate condition.

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